DOCUMENT RESUME

ED 223 908 CE 034 618

AUTHOR	Hill, Pamela
TITLE	Things for You to Know. Fuel System. Student Manual--Introduction. Small Engine Repair Series. First Edition.
INSTITUTION	East Texas State Univ., Commerce. Occupational Curriculum Lab.
SPONS AGENCY	Texas Education Agency, Austin. Dept. of Occupational Education and Technology.
PUB DATE	82
NOTE	105p.; For related documents, see ED 222 717, ED 221 760-767, and CE 034 617-621.
AVAILABLE FROM	Occupational Curriculum Laboratory, East Texas State University, Commerce, TX 75428.
PUB TYPE	Guides - Classroom Use - Materials (For Learner) (051)
EDRS PRICE	MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	Auto Mechanics; Behavioral Objectives; Course Content; *Disabilities; *Engines; High Interest Low Vocabulary Books; Job Skills; Learning Activities; Learning Disabilities; Mainstreaming; Mechanics (Process); Motor Vehicles; Power Technology; Secondary Education; *Special Education; Technical Education; *Units of Study; Vocational Education
IDENTIFIERS	*Automotive Fuel Systems; Carburetors; *Small Engine Mechanics

ABSTRACT

This student manual, part of a small-engine repair series on servicing fuel systems, is designed for use by special needs students in Texas. Information covered in this manual is considered to be the minimum that students need to know about fuel systems in order to get small-engine repair jobs. The manual introduces students to small-engine fuel systems with numerous illustrations and pictures, using written material on a low reading level. Information is given in small sequential segments so that the students are not overwhelmed with the amount of information to be learned. Short review sections titled "How Much Do You Remember?" aid students to learn individually the information that is grouped together before going on to the next segment. Material introduced in this manual includes the fuel system, the carburetor, the air cleaner, types of carburetors, safety, and good work habits. (KC)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED223908

STUDENT MANUAL-INTRODUCTION

FUEL SYSTEM
SMALL ENGINE REPAIR SERIES

THINGS FOR YOU TO KNOW

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

This document has been reproduced as received from the person or organization originating it.

Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

Prepared By
Pamela Hill

"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY

D Bruston

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

MATERIALS DEVELOPED AND DISTRIBUTED BY
OCCUPATIONAL CURRICULUM LABORATORY
EAST TEXAS STATE UNIVERSITY
COMMERCE, TEXAS 75428

IN COOPERATION WITH
OCCUPATIONAL EDUCATION AND TECHNOLOGY
TEXAS EDUCATION AGENCY
AUSTIN, TEXAS 78701

CE 034 618

FIRST EDITION
1982

Frances Hyatt
EDITOR

Bob Norsworthy
ART DIRECTOR

Brand names, company names, trademarks, or other identifying symbols appearing in the text are used to clarify and identify and do not constitute a recommendation or endorsement.

OCCUPATIONAL CURRICULUM LABORATORY

ETSU an Equal Opportunity University complies with all federal requirements prohibiting discriminatory activities

WHAT YOU WILL FIND IN THIS BOOKLET

The point of this booklet ..... Page 1
What you will have to know and do ..... Page 2
What is the fuel system? ..... Page 4
What are the major parts of the fuel system? ..... Page 8
What do the fuel system parts do? ..... Page 10
What are the 3 types of fuel-feed systems? ..... Page 14
What does the air cleaner do? ..... Page 21
Why is it important to service the air cleaner? ..... Page 25
What are the parts of an air cleaner? ..... Page 28
What are the 3 types of air cleaners? ..... Page 30
What does the carburetor do? ..... Page 35
What are the controls of the carburetor? ..... Page 42
What are the 3 types of carburetors? ..... Page 49
What are the parts of a suction carburetor with an automatic choke? ..... Page 54
What do the parts of a suction carburetor with an automatic choke do? ..... Page 57

How does the automatic choke work? ..... Page 59
What are the parts of a float carburetor? ..... Page 63
What do the parts of a float carburetor do? ..... Page 67
What do you know about the fuel system? ..... Page 73
Safety to follow ..... Page 74
Good work habits to follow ..... Page 78
Can you follow safety and good work habits? ..... Page 96

THE POINT OF THIS BOOKLET

As a small engine mechanic, you may have to repair the fuel system on small gas engines like the lawnmower. This booklet will help you learn:

- Things about the fuel system
- Safety and good work habits to follow

As you learn about the fuel system, you and your teacher can rate your progress on the charts on pages 74 and 96.

WHAT YOU WILL HAVE TO KNOW AND DO

Before you learn to do the repair jobs on the fuel system, you will need to know and do some things. These are:

KNOW

- What the fuel system is
- The parts of the fuel system
- What the fuel system parts do
- Three types of fuel-feed systems
- What the air cleaner does
- Why it's important to service the air cleaner
- The parts of the air cleaner
- Three types of air cleaners
- What the carburetor does

DO

- Follow safety rules
- Follow good work habits

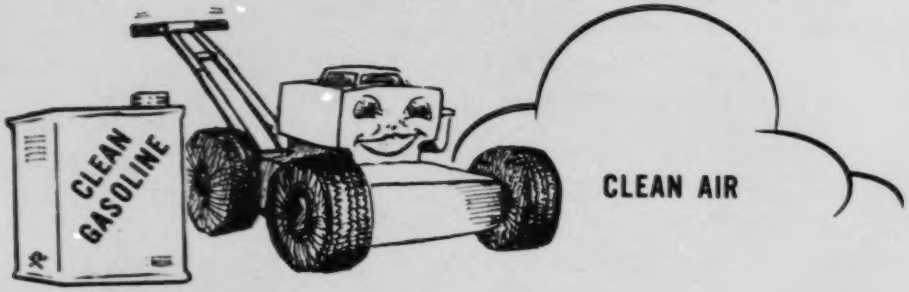
KNOW

- The controls of the carburetor
- Three types of carburetors
- The parts of a suction carburetor with an automatic choke
- What the parts of a suction carburetor with an automatic choke do
- How the automatic choke works
- The parts of a float carburetor
- What the parts of a float carburetor do

WHAT IS THE FUEL SYSTEM?

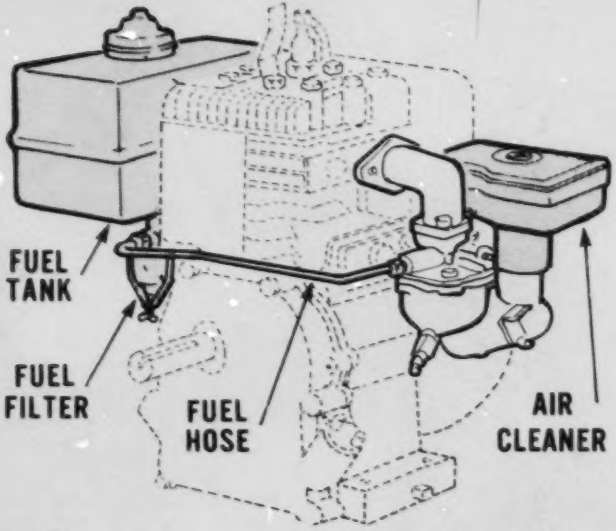
1. Every small gas engine must have:

- Clean gasoline **and** clean air

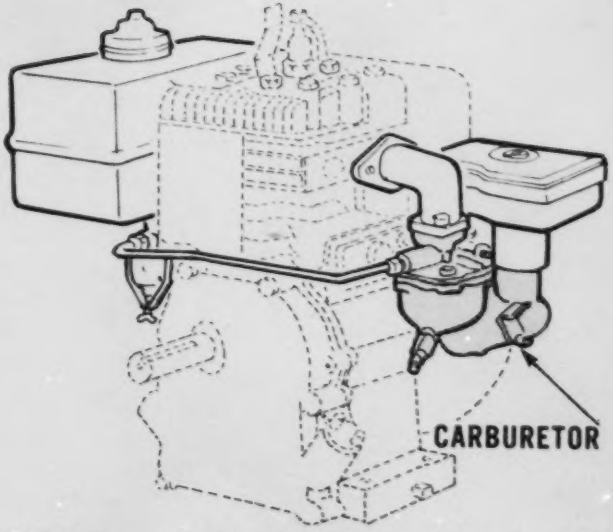


- The correct mixture of clean gasoline and air to make the engine start and run properly.

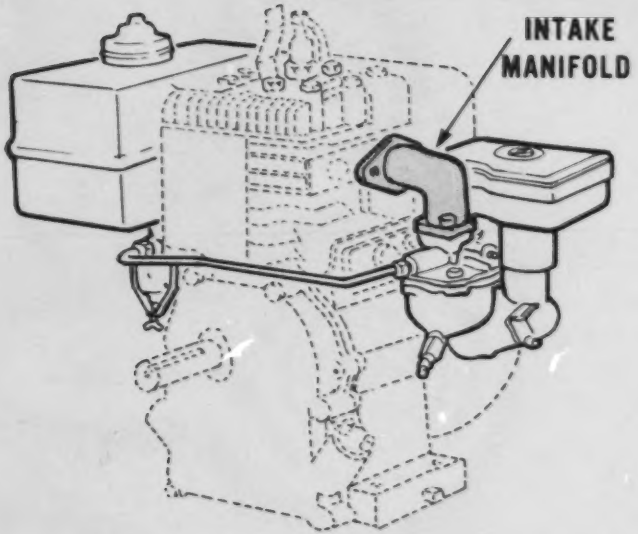
2. The fuel system is the engine parts that:



- Gives the engine clean gasoline and air.



- Turns gasoline into a spray and mixes the correct amount of air with the gas spray.



- Carries the fuel mixture to the combustion chamber where it ignites from a spark of fire.

11

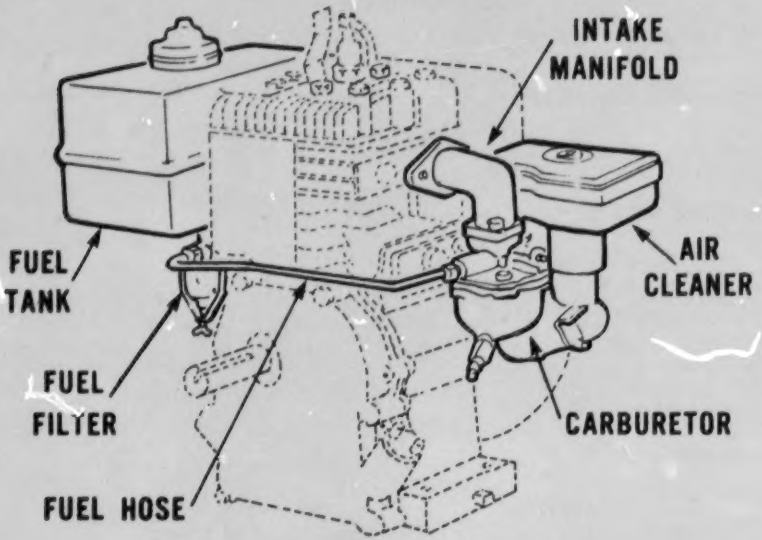
HOW MUCH DO YOU REMEMBER?

Fill in the blanks with the correct phrase from the list below.

a. correct mixture of oil and air
b. clean air
c. gives the engine a spark of fire
d. turns gas into a spray and mixes it with air
e. clean gasoline
f. carries fuel mixture to the combustion chamber
g. the correct mixture of clean gas and air to make the engine start and run properly
h. gives the engine clean gas and air

1. Every small gas engine must have _____,
_____ and _____.
2. The fuel system is the engine parts that do these three things:
_____
_____
_____

WHAT ARE THE MAJOR PARTS OF THE FUEL SYSTEM?

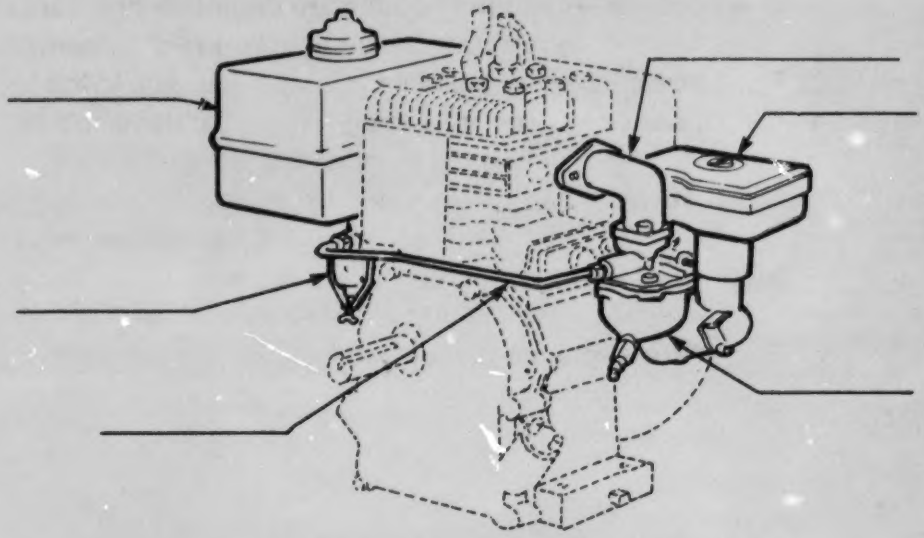


13

HOW MUCH DO YOU REMEMBER?

Label the parts of the fuel system with the correct number or word below.

1. fuel tank
2. air cleaner
3. carburetor
4. fuel hose
5. fuel filter
6. intake manifold



WHAT DO THE FUEL SYSTEM PARTS DO?

1. **Fuel tank**—stores gasoline for engine use
2. **Carburetor**—changes liquid gasoline into a fine spray and then mixes the gas spray and air in the correct amounts so that it can burn.
3. **Fuel hose**—carries gasoline from the fuel tank to the carburetor.
4. **Air cleaner**—takes in outside air and cleans the dirt and dust out of it before the air goes into the carburetor.
5. **Fuel pump**—pumps gasoline from the fuel tank, through the fuel hose and into the carburetor. (Not all engines have a fuel pump.)
6. **Intake manifold**—carries the fuel mixture to the combustion chamber where it ignites from a spark of fire.
7. **Fuel filter**—cleans dirt out of the gasoline before the gas goes to the carburetor.

HOW MUCH DO YOU REMEMBER?

Circle the correct answer.

1. The fuel tank:
   a. stores air for engine use
   b. stores gasoline for engine use
   c. stores oil for engine use

2. The jobs of the carburetor are to:
   a. change liquid gas into a spray and then mix it with air in the correct amounts
   b. carry oil to all of the moving engine parts
   c. make a spark of fire and burn the fuel mixture

3. The part of the fuel system that takes in outside air and cleans the dirt and dust out of it is called the:
   a. fuel filter
   b. carburetor
   c. air cleaner
4. The fuel hose carries:
   a. gasoline from the fuel tank to the carburetor
   b. air from the air cleaner to the carburetor
   c. oil from the oil sump to the moving engine parts
5. On some gas engines, this part pumps gas from the fuel tank through a fuel hose and into the carburetor:
   a. air cleaner
   b. piston
   c. fuel pump

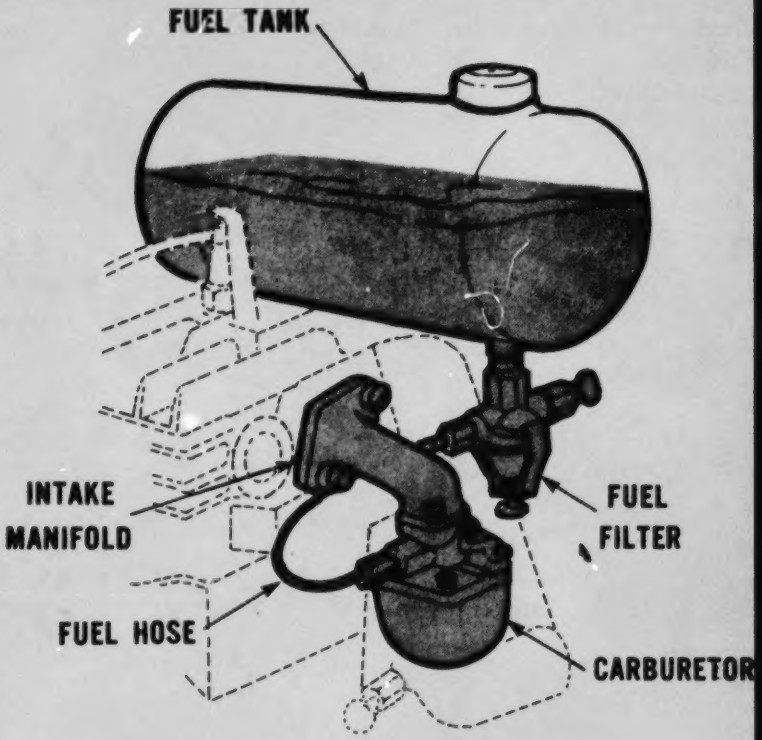
6. The part of the fuel system that carries the fuel mixture to the combustion chamber where it ignites is the:
   a. outside manifold
   b. intake manifold
   c. spark plug

7. The fuel filter does this job:
   a. cleans dirt out of the gasoline before the gas goes to the carburetor
   b. cleans dirt out of the air before the air goes to the carburetor
   c. carries the gasoline to the carburetor

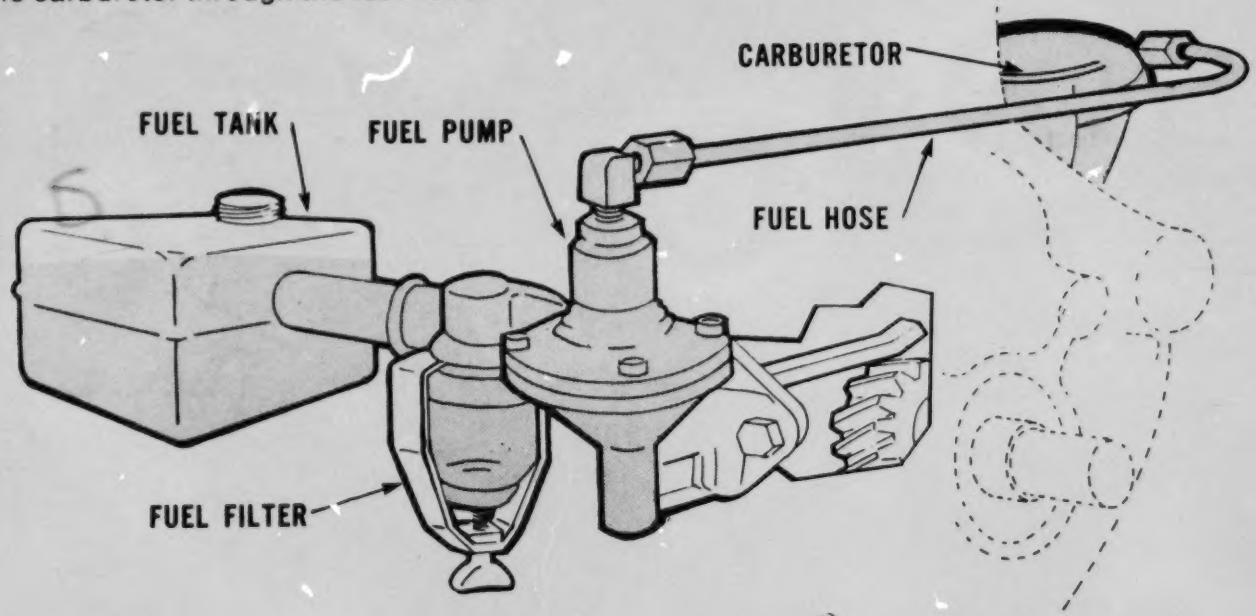
WHAT ARE THE 3 TYPES OF FUEL-FEED SYSTEMS?

1. Gasoline is stored in the fuel tank on small gas engines.
2. There must be a way for the gasoline in the fuel tank to get to the carburetor when the carburetor needs it.
3. There are 3 different ways that gasoline can get from the fuel tank to the carburetor.
4. These 3 ways are called "Types of Fuel-Feed Systems."
5. The 3 Types of Fuel-Feed Systems are:

Gravity-Feed Fuel System—The fuel tank is above the carburetor so the gas will run downhill to the carburetor through the fuel hose.

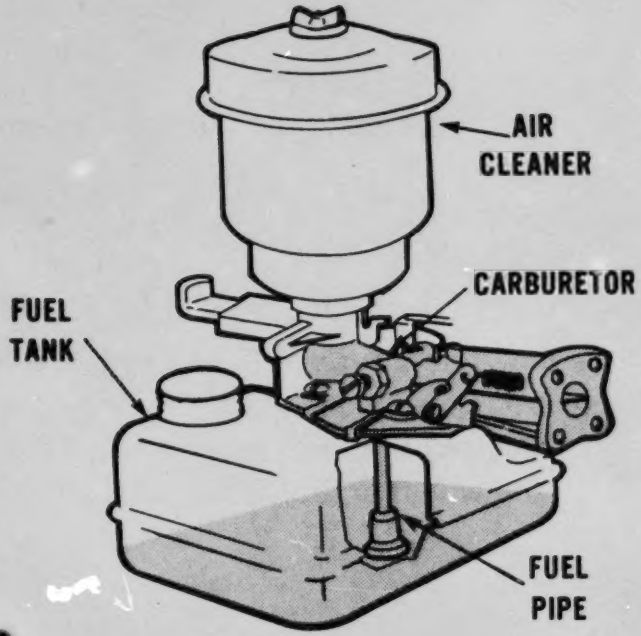


Pump-Feed Fuel System—A fuel pump feeds gas from the fuel tank to the carburetor through the fuel hose.



21

Suction-Feed Fuel System—Fuel pipes suck gas from the fuel tank up and into the carburetor. In the suction-feed fuel system, the carburetor usually sits on top of the fuel tank.



HOW MUCH DO YOU REMEMBER?

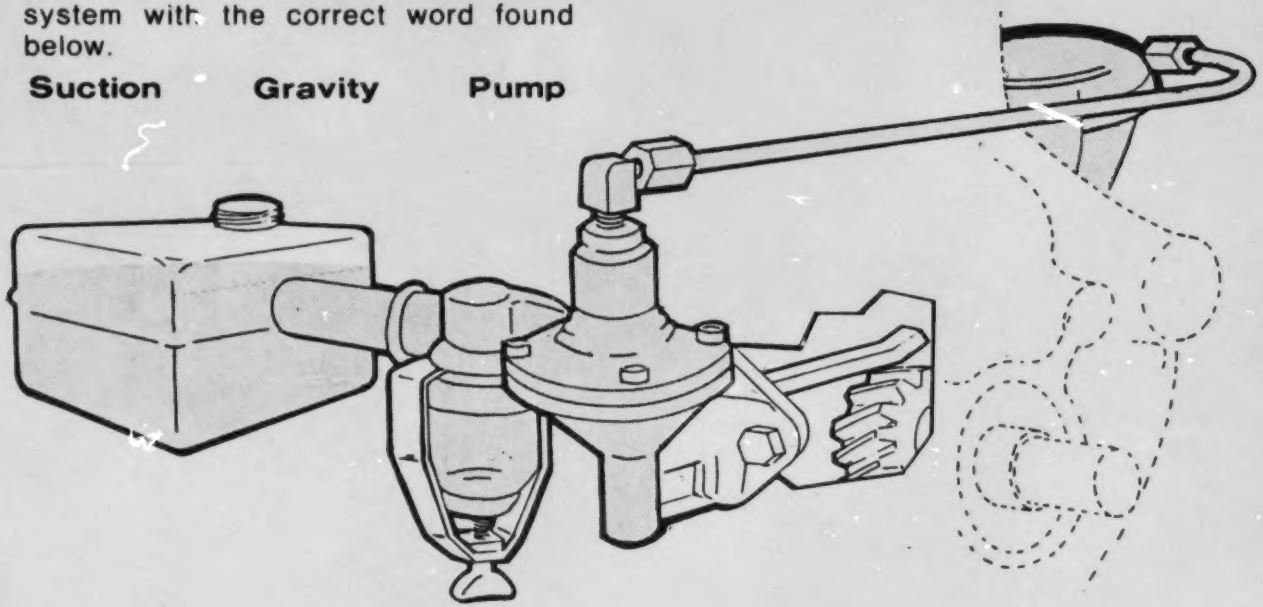
A. Circle the correct answer.

1. What is stored in the fuel tank on small gas engines?
   a. water
   b. oil
   c. gasoline

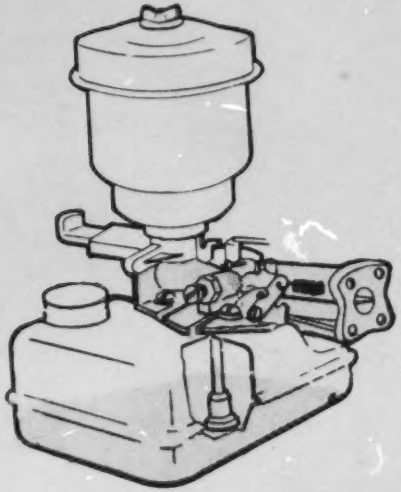
2. The words, "Type of Fuel-Feed System," means:
   a. the way oil lubricates the engine parts
   b. the way that fuel gets from the fuel tank to the carburetor
   c. the way that fuel mixes with air

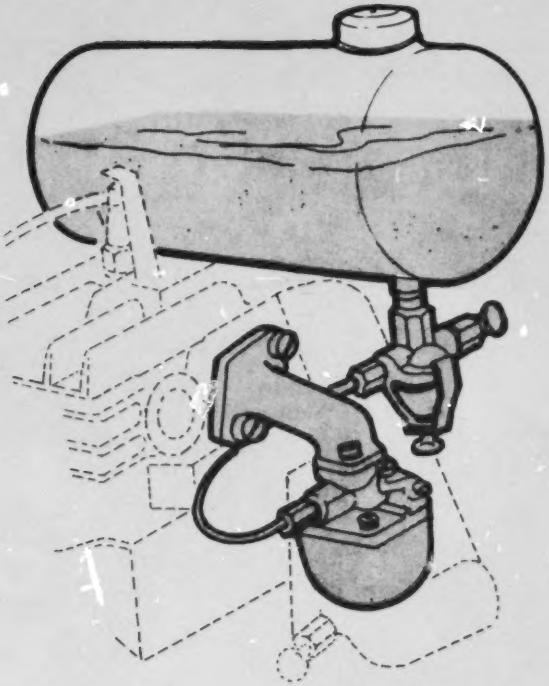
B. There are 3 Types of Fuel-Feed Systems. Label each picture of a fuel-feed system with the correct word found below.

Suction **Gravity** **Pump**



1. _____-Feed Fuel System





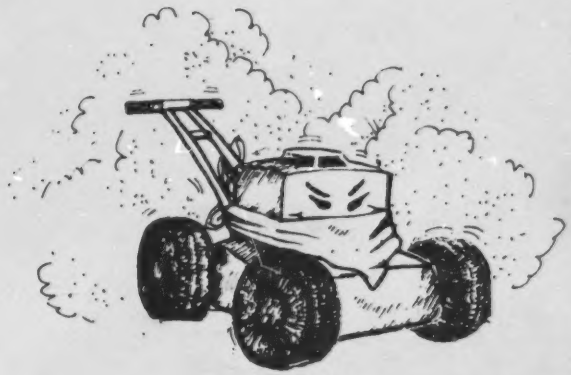
2. _____-Feed Fuel System

3. _____-Feed Fuel System

25

WHAT DOES THE AIR CLEANER DO?

1. An engine needs:
   - **a lot of air**
   - **clean air**
2. An engine needs **a lot of air** to make a good fuel mixture that will burn and run the engine.
3. An engine needs **clean air** because dirty air in the engine will wear out the moving engine parts.



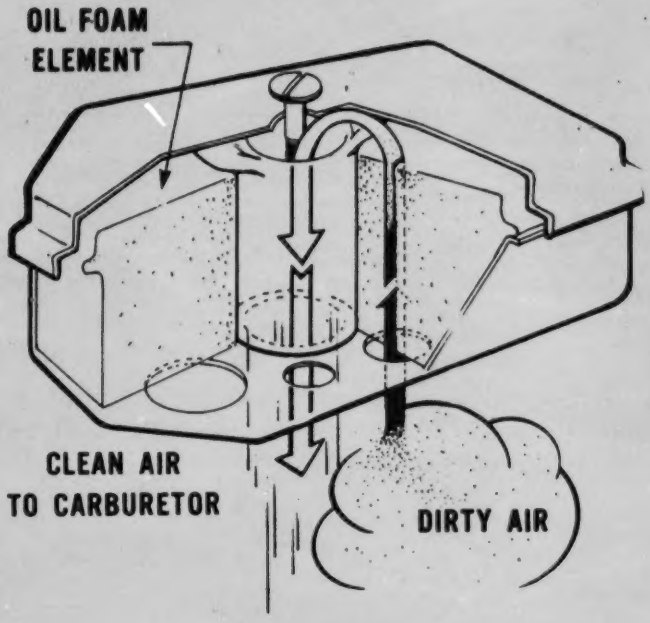
4. So, there must be a way to get air into the engine and then clean the dirt and dust out of the air.

5. The air cleaner's job is to:

- take in a lot of air for the engine to use

and

- clean the dirt and dust out of this air



HOW MUCH DO YOU REMEMBER?

Circle the correct answer.

1. An engine needs:
   a. a lot of dirty air
   b. a lot of water
   c. a lot of clean air

2. Why does the engine need a lot of air?
   a. to make a good fuel mixture that will burn and run the engine
   b. to help the engine stay cool on hot summer days
   c. to help lubricate the moving engine parts

3. Why does the engine need clean air?
   a. because dirty air is not clean
   b. because dirty air will wear out the moving engine parts
   c. to help pull the starter rope

4. The engine part that takes in a lot of air and cleans the dirt and dust out of the air is called the:
   a. air duster
   b. carburetor
   c. air cleaner

5. What is the air cleaner's job?
   a. to take in dirty air and send it to the carburetor
   b. to take in a lot of air and clean it
   c. to mix the air with gasoline

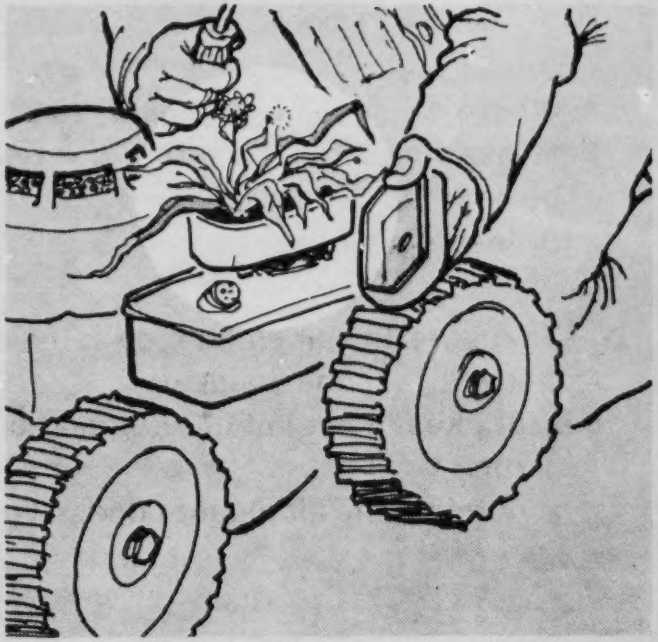
WHY IS IT IMPORTANT TO SERVICE THE AIR CLEANER?

1. Most small engines run near the ground where the air is very dusty and dirty.

2. The air cleaner's job is to take in a lot of this dirty air and clean it every time the engine is run, so the air cleaner gets dirty very quickly.

3. If the dirty air cleaner is not cleaned often, then it:
   - lets some of the dirt into the moving engine parts and wears them out
   - doesn't let enough air into the engine to make it run

4. So, it is very important to clean the air cleaner after every 25 hours of operation and more in very dusty areas.



HOW MUCH DO YOU REMEMBER?

Circle the correct answer.

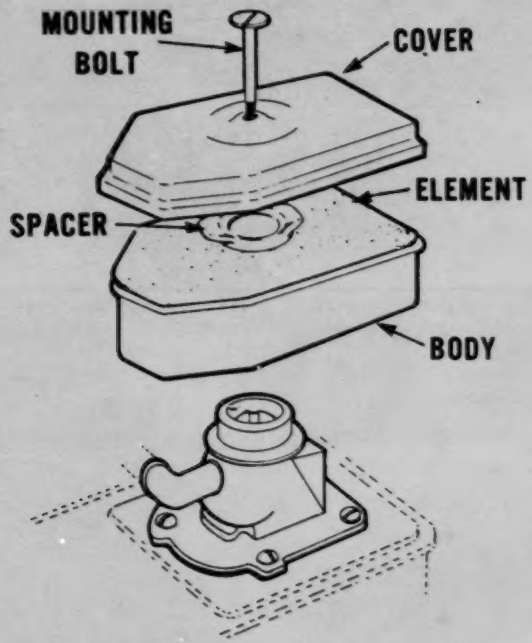
1. Where do most small engines run?
   a. near the ground where it is very dusty and dirty
   b. near the sun
   c. inside houses

2. What does the air cleaner do to make it dirty?
   a. it lets gasoline inside it
   b. it takes in a lot of dirty air and cleans it every time the engine runs
   c. nothing; the air cleaner doesn't get dirty

3. What are 2 things that might happen in the engine if the air cleaner is not cleaned often?
   a. the engine will overheat and die
   b. the engine will keep on running and be okay
   c. the engine will not get enough air to run and dirt may get on the moving engine parts and wear them out

4. How often should an air cleaner be cleaned?
   a. after every 50 hours of operation
   b. every summer
   c. after every 25 hours of operation and more often in dusty areas

WHAT ARE THE PARTS OF AN AIR CLEANER?

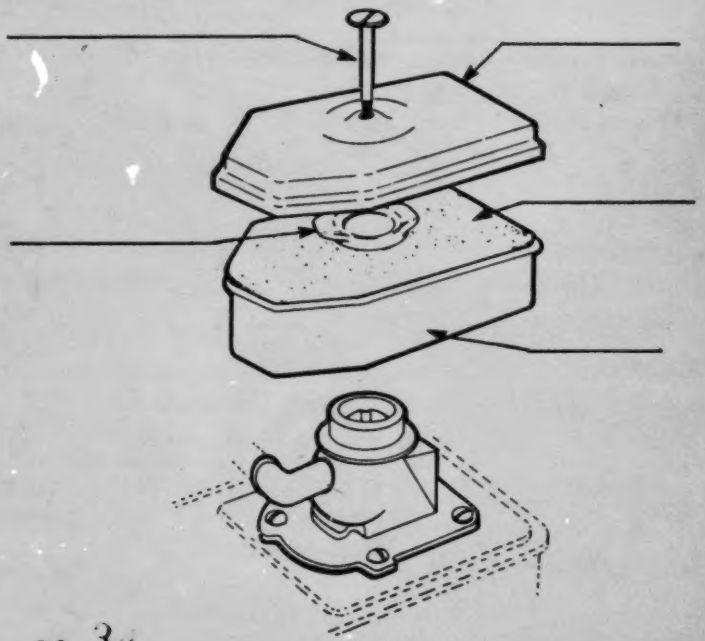


33

HOW MUCH DO YOU REMEMBER?

Label the parts of an air cleaner with the correct number or word below.

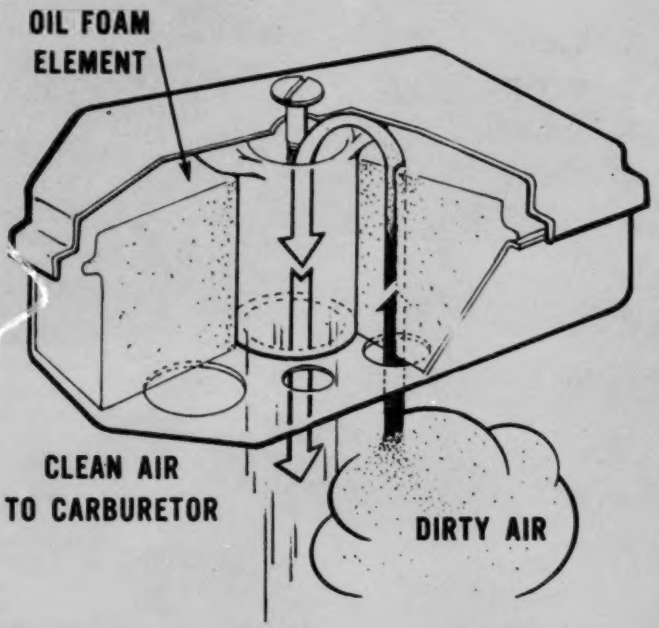
1. body
2. mounting bolt
3. spacer
4. cover
5. element



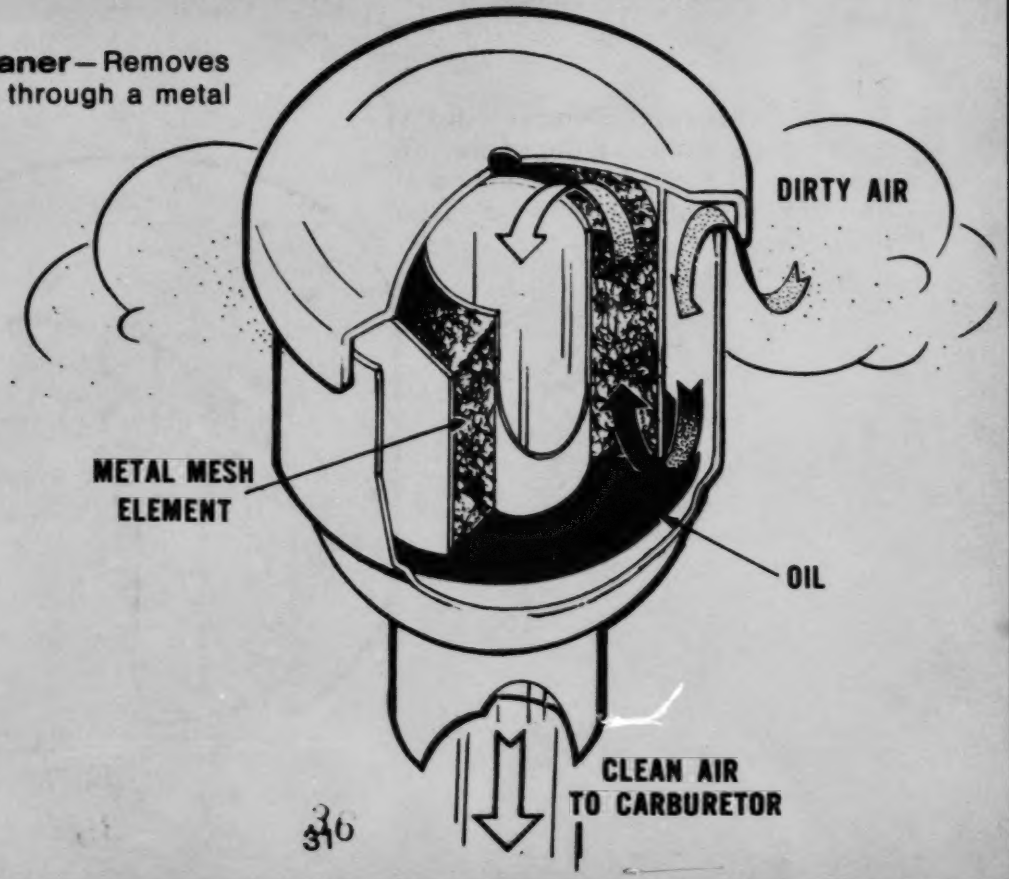
WHAT ARE THE 3 TYPES OF AIR CLEANERS?

There are 3 types of air cleaners used on small gas engines.

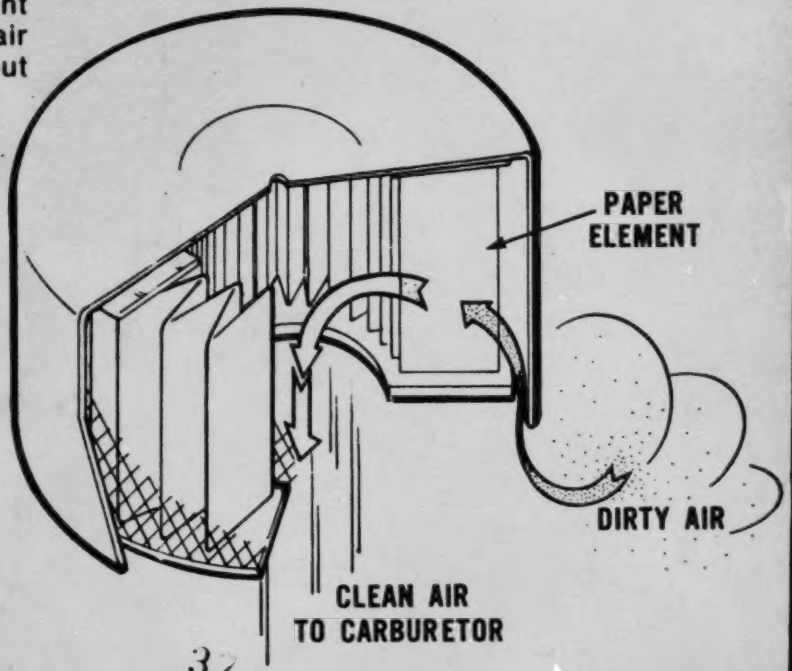
1. **Oil-foam air cleaner**— Removes dirt as the air goes through a foam rubber element that has been soaked with oil.



2. **Oil-bath air cleaner**—Removes dirt as the air goes through a metal mesh element.



3. **Dry air cleaner**—Removes dirt as the air goes through a paper element that has very tiny holes in it. The air can get through the tiny holes but the dirt can't.

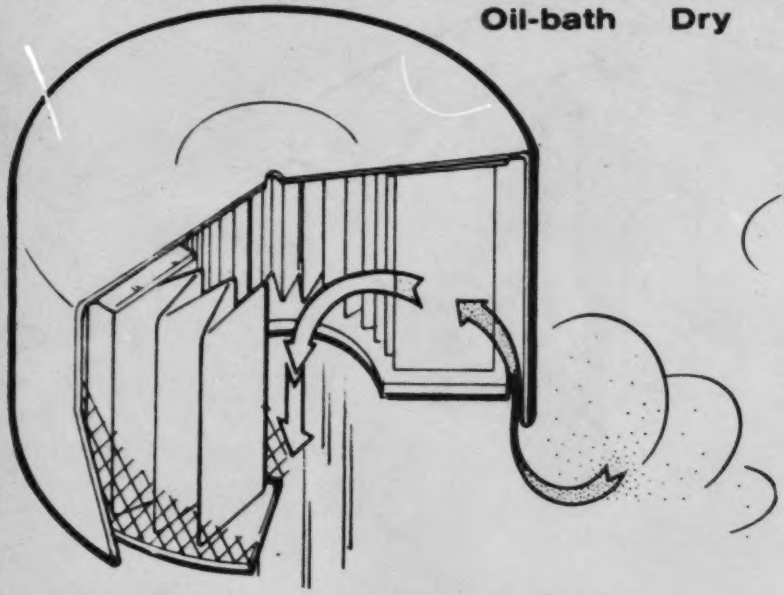


37

HOW MUCH DO YOU REMEMBER?

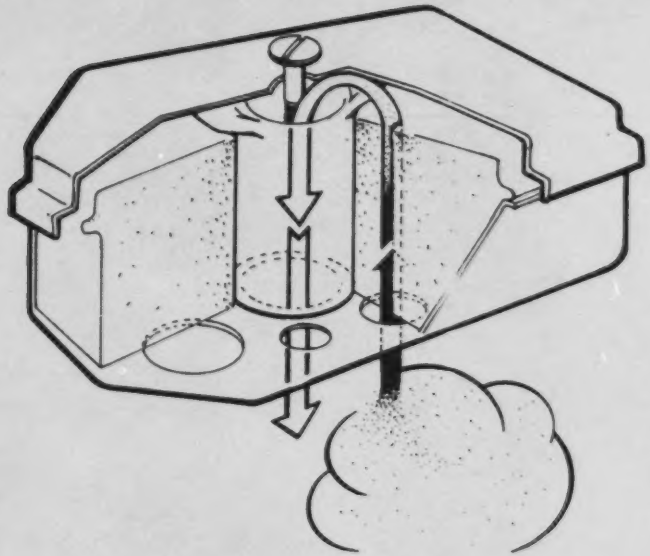
Label each picture of an air cleaner with the correct word found below.

Oil-bath **Dry** **Oil-foam**



1. _____ air cleaner

2. _____ air cleaner



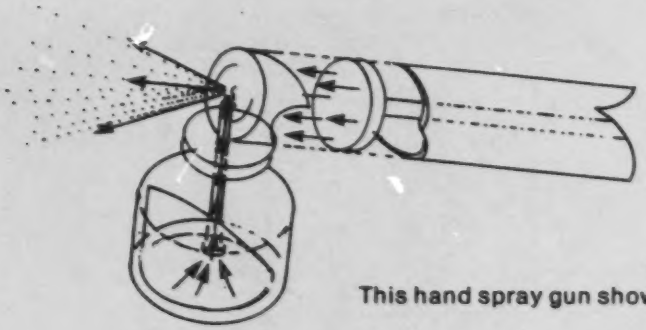
3. _____ air cleaner

39

WHAT DOES THE CARBURETOR DO?

Three things need to happen in the carburetor so that the engine will run. These are:

1. Liquid gasoline turned into a spray or a vapor.

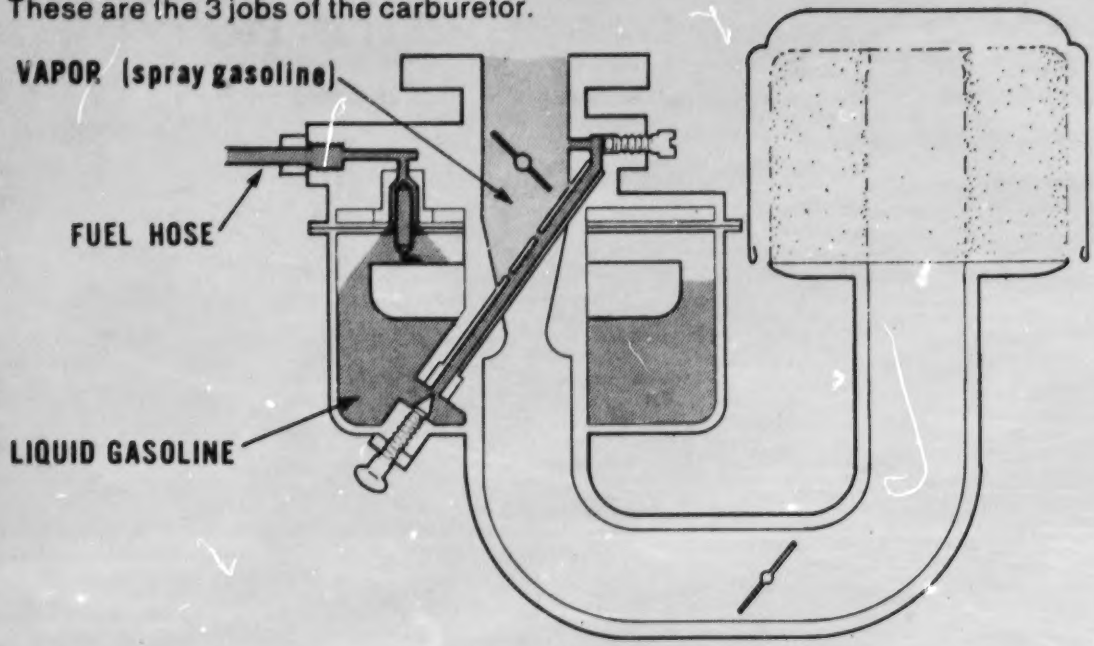


This hand spray gun shows how gasoline turns into a vapor.

2. Exact amounts of air and fuel vapor made into a mixture.

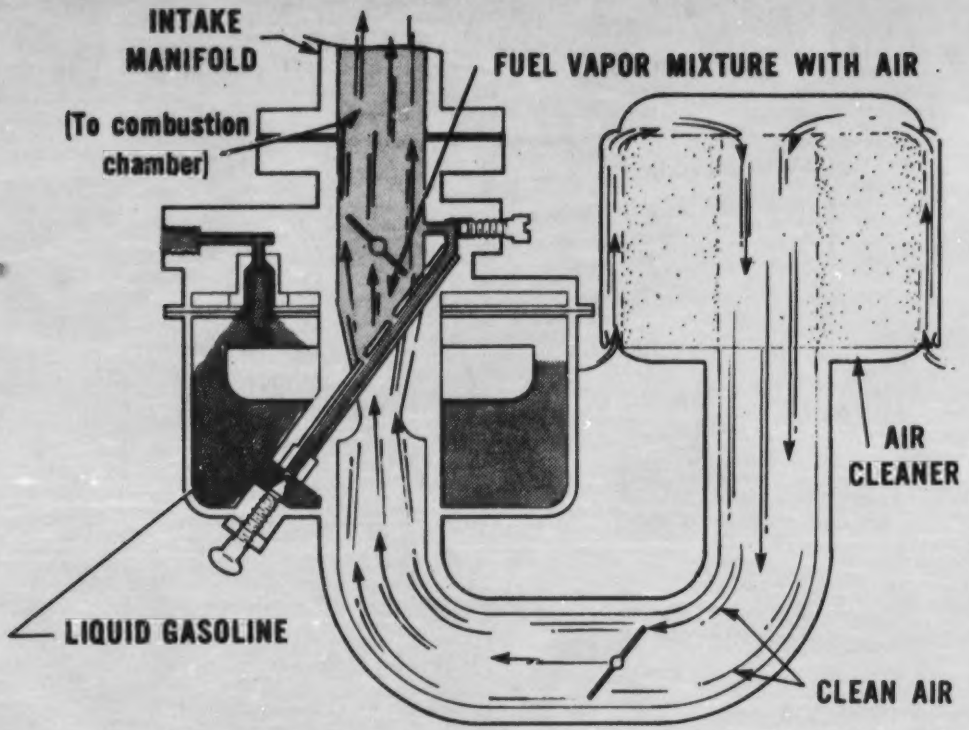
3. A continuous flow of air and fuel mixture going to the combustion chamber.

These are the 3 jobs of the carburetor.

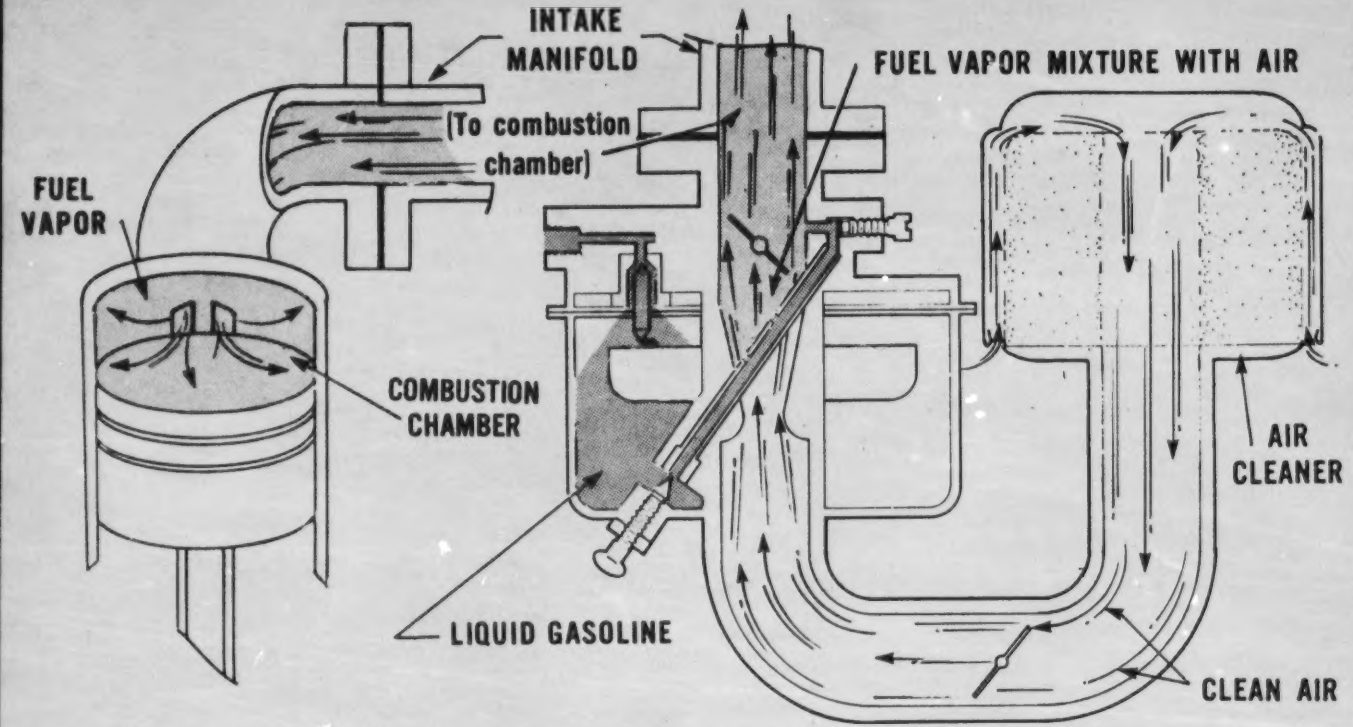


1. Turns liquid gasoline into a spray, or vapor. A vapor is something like smoke.

41



2. Mixes clean air with fuel vapor in the exact amounts that the engine needs. An engine needs 15 times more air than fuel to run at normal running speed.



3.Gives a continuous flow of the fuel-air mixture going to the combustion chamber.

HOW MUCH DO YOU REMEMBER?

A. Place an "X" in front of each correct sentence.

_____1. In the carburetor, liquid gasoline is turned into a spray or vapor.

_____2. There is only one thing that needs to happen in the carburetor and that is to turn liquid gas into a vapor.

_____3. It doesn't matter how much air is mixed with fuel vapor for the engine to run.

_____4. One thing that happens in the carburetor is that exact amounts of air and fuel vapor are made into a mixture.

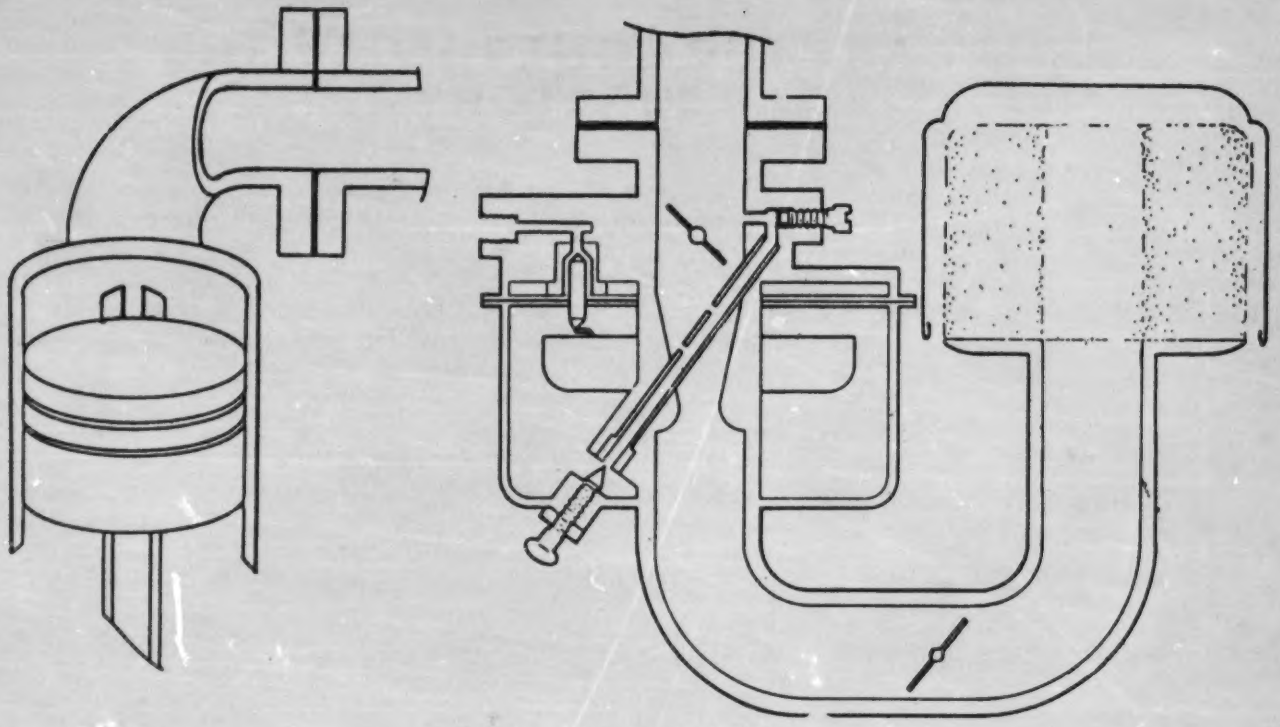
_____5. The carburetor also gives a continuous flow of air and fuel mixture to the engine combustion chamber.

_____6. Once the air-fuel mixture starts the engine, then no more air-fuel mixture is needed to keep the engine running.

B. Draw the flow of gasoline with a red pencil and the flow of air with a blue pencil on the picture of an air cleaner, carburetor, and combustion chamber found on the next page.

HINT: Show where:

1. Gasoline and air come into the carburetor
2. Gasoline turns into a vapor
3. Fuel vapor and air mix together
4. The air-fuel mixture goes into the combustion chamber



46

WHAT ARE THE CONTROLS OF THE CARBURETOR?

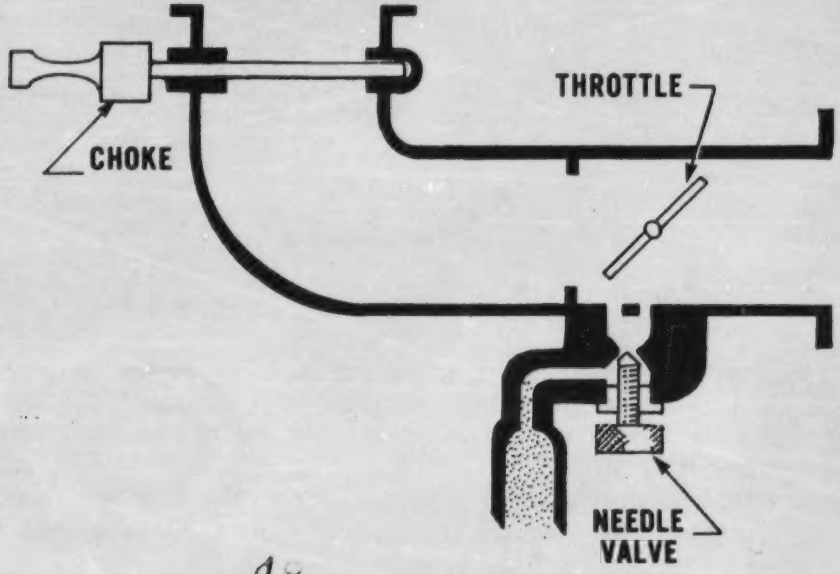
1. You have just learned that the carburetor gives the engine the correct mixture of air and fuel that the engine needs to make it start and run.
2. This job of the carburetor is much harder than it sounds because the carburetor must still give the engine the correct air-fuel mixture when the engine:

- runs at different speeds,
- runs under different work loads, and
- starts during different weather temperatures.

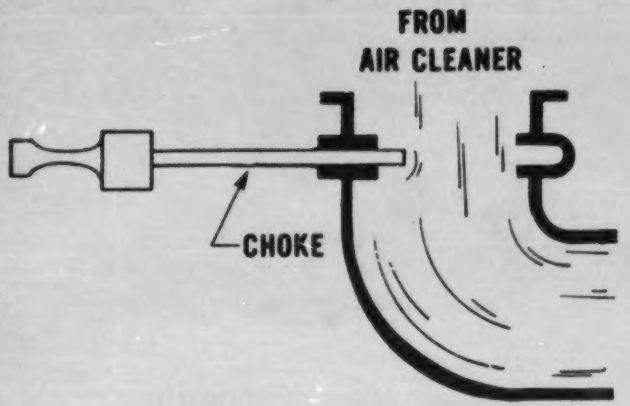
3. The carburetor has 3 controls on it to help give the correct air-fuel mixture to the engine needed for starting and running under these different situations.

4. These 3 controls are called the:

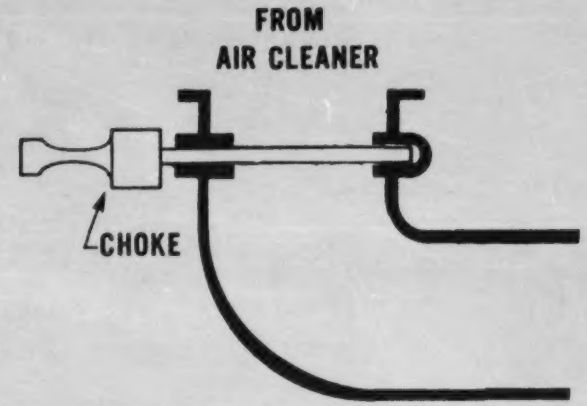
- **Choke**
- **Throttle**
- **Needle valve**



48

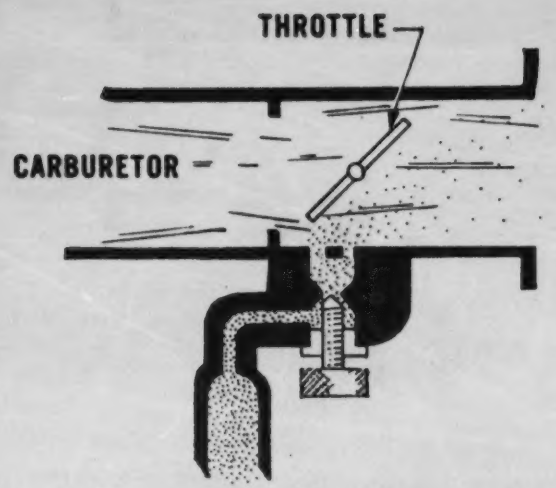


"Choke Open"

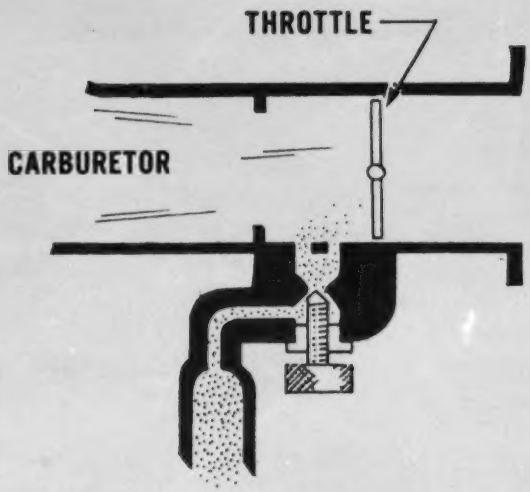


"Engine Choked"

5. The **choke** is found between the air cleaner and carburetor air tube. When the temperature and the engine are cold, the engine needs more fuel than air to make it start so you need to stop some of the air from going into the carburetor. This is called "choking the engine." When you **choke the engine**, you close the choke. When the engine starts, open the choke so that the engine will get the correct air-fuel mixture to continue running.

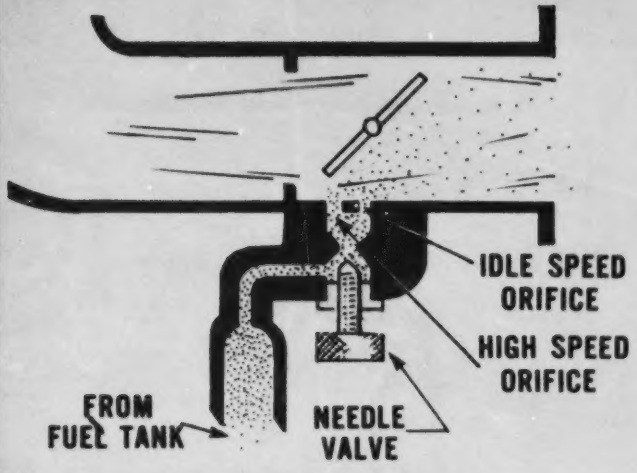


"Throttle Open"

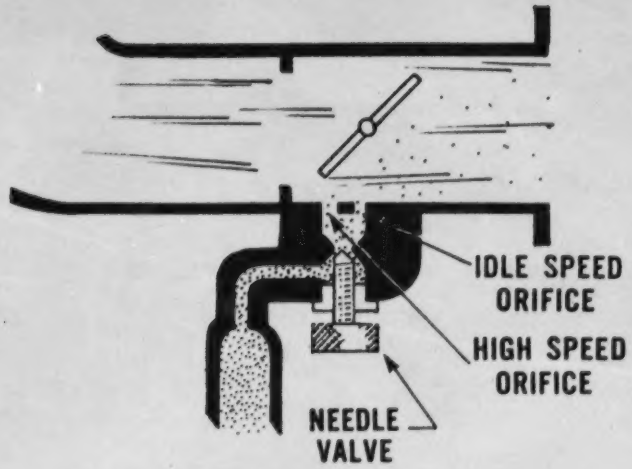


"Throttle Closed"

6. The **throttle** is found near the end of the carburetor air tube before the air-fuel mixture goes to the combustion chamber. The throttle controls the amount of air-fuel mixture that goes to the combustion chamber. If you want the engine to run fast, open the throttle. If you want the engine to run slow, close the throttle.



"Needle Valve Open"



"Needle Valve Closed"

7. The **needle valve** on the carburetor controls the amount of liquid gasoline that is sprayed into the air stream. Some carburetors have 2 needle valves called the **high-speed needle valve** and **idle-speed needle valve.** The high-speed needle valve controls the liquid gasoline that is sprayed into the air stream when the engine is running at different working speeds. The idle-speed needle valve controls the liquid gasoline that is sprayed into the air stream when the engine is idling.

51

HOW MUCH DO YOU REMEMBER?

Place an "X" in front of each correct sentence.

_____ 1. The carburetor's job of making an air-fuel mixture is easy because the engine always runs at the same speed.

_____ 2. The carburetor has to make the correct air-fuel mixture for the engine to run at different speeds, under different work loads, and start during different weather temperatures.

_____ 3. The carburetor has 3 controls on it to help give the correct air-fuel mixture to the engine.

_____ 4. The 3 controls on the carburetor are the choke, spark plug, and contact points.

_____ 5. The 3 controls on the carburetor are the choke, throttle, and needle valve.

_____ 6. The choke controls the amount of air-fuel mixture that goes to the combustion chamber.

_____ 7. When you choke the engine, you stop some of the air from going into the carburetor.

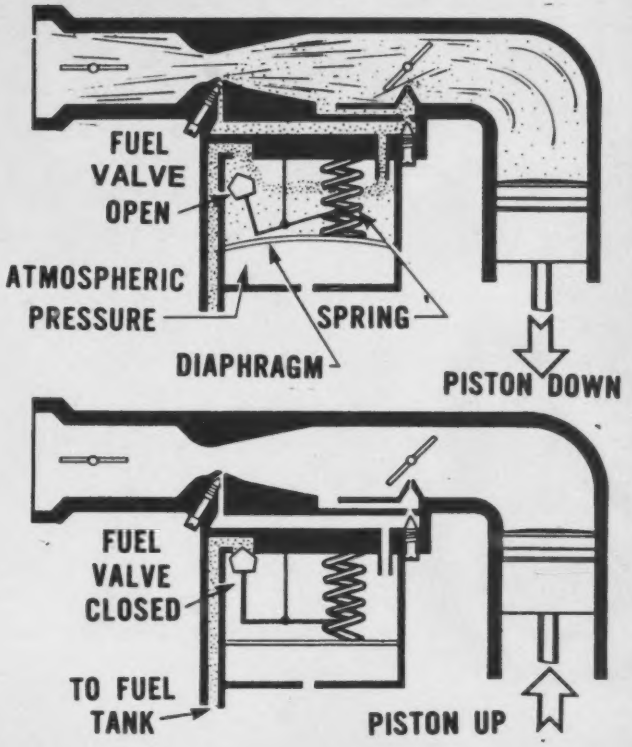
_____ 8. The throttle controls the amount of air-fuel mixture that goes to the combustion chamber.

_____ 9. If you want the engine to run slowly, open the throttle.

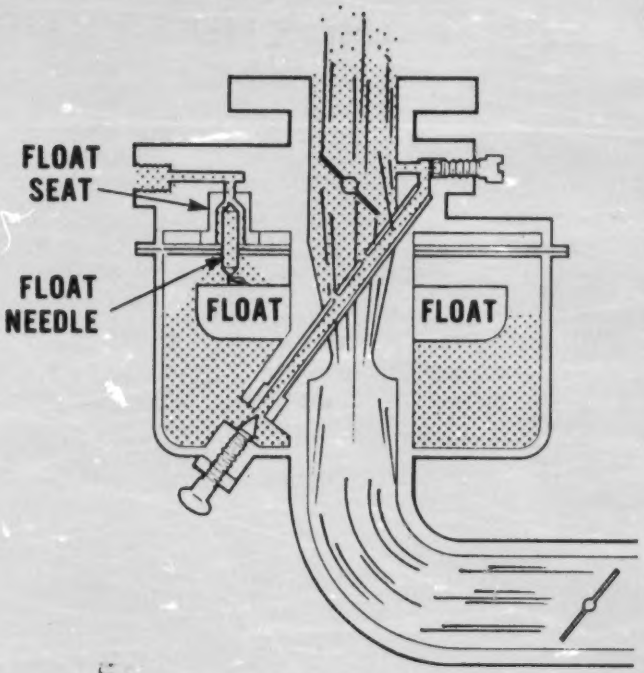
_____10. The needle valve controls the amount of liquid gasoline that is sprayed into the air stream.

WHAT ARE THE 3 TYPES OF CARBURETORS?

1. **Diaphragm-type**—A thin, rubber-like sheet found between the upper carburetor body and carburetor bowl. The diaphragm holds a fuel valve open to let gas into the carburetor bowl. When the bowl is full, a spring pushes the valve closed so that no more gas comes into the carburetor.

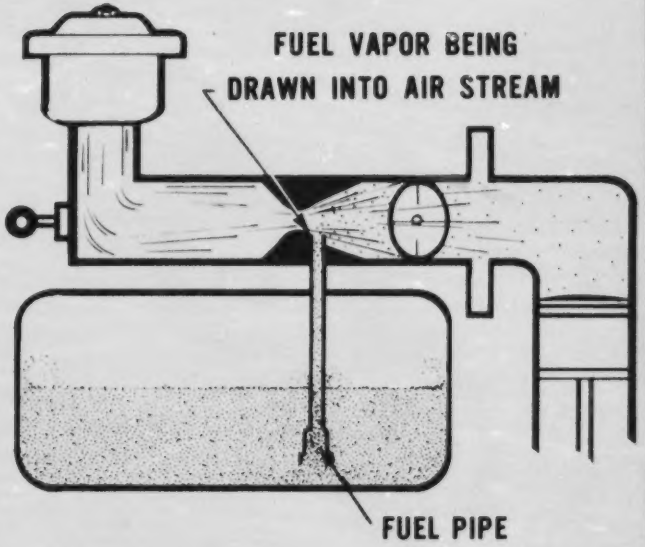


2. **Float-type**—A ball or dounut-shaped float and float needle valve let gasoline into the carburetor bowl. When the bowl is full, the float pushes the float needle valve into the seat so that no more gas drips into the carburetor. One of the float-type carburetors is called the two-piece flo-jet carburetor. You will learn how to service this type of carburetor.



55

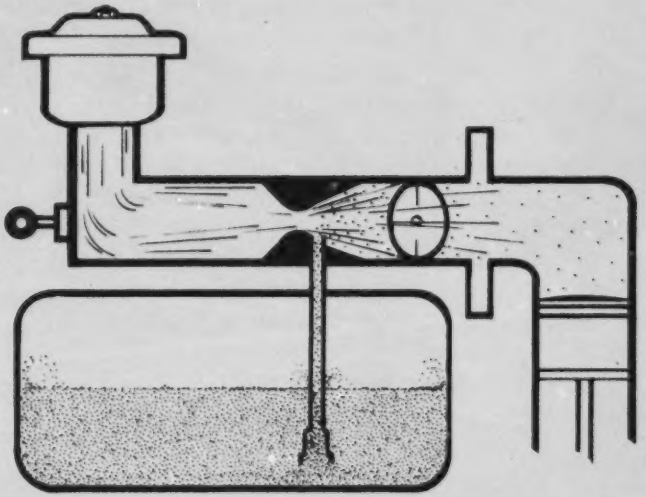
3. **Suction-type**—As the piston moves down, gas is sucked from the fuel tank into the carburetor where it mixes with air. No gas is stored in this type carburetor. One of the larger suction-type carburetors has an automatic choke on it and is called a pulsa-jet carburetor with an automatic choke. On this suction-type carburetor, there is a diaphragm between the carburetor and fuel tank to help make the automatic choke work. You will learn how to replace this diaphragm on a pulsa-jet carburetor with an automatic choke.



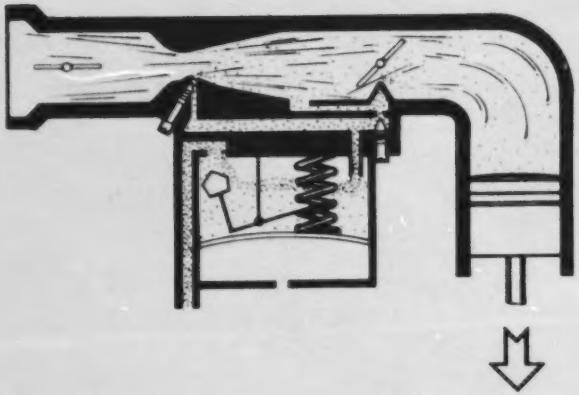
HOW MUCH DO YOU REMEMBER?

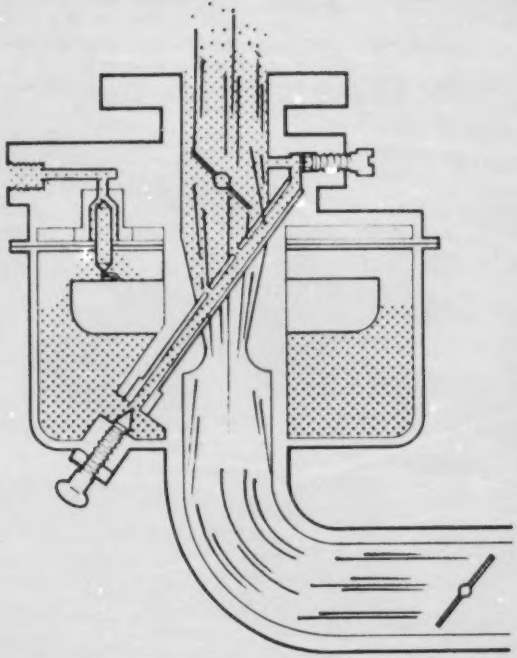
Label each picture of a carburetor with the correct word found below.

Float **Suction** **Diaphragm**



1. _____ carburetor

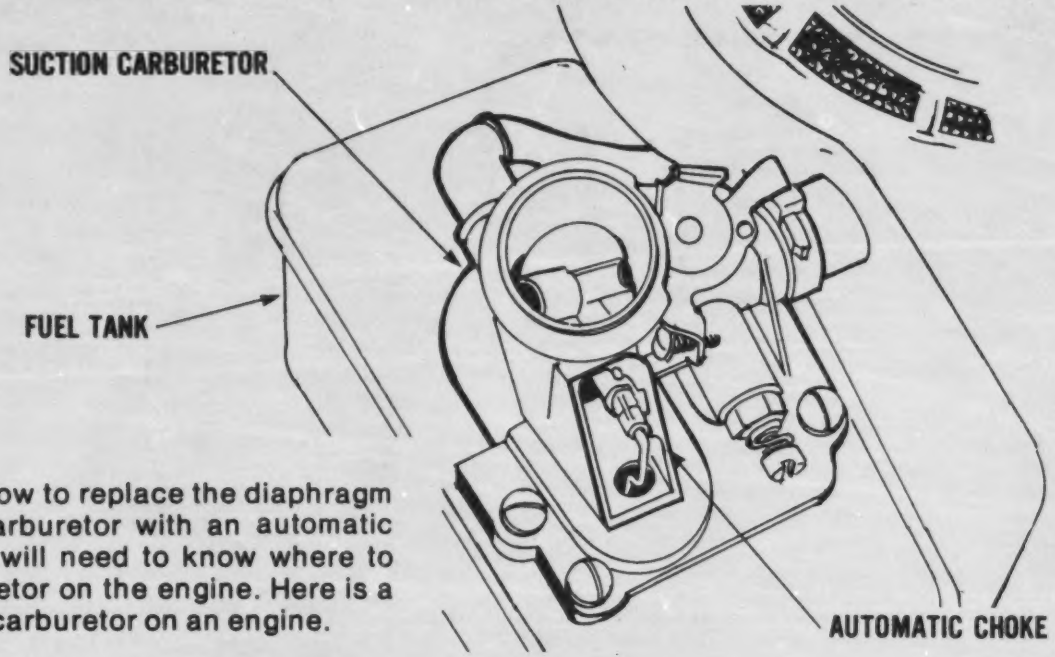




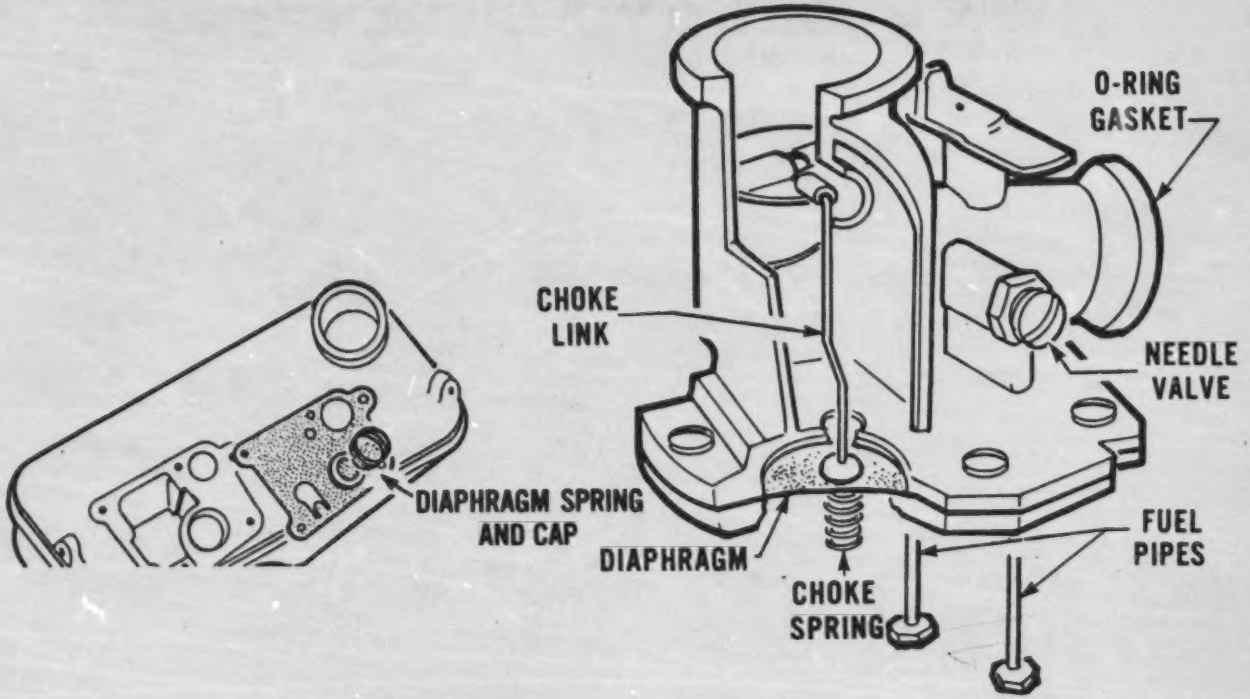
2. _____ carburetor

3. _____ carburetor

WHAT ARE THE PARTS OF A SUCTION CARBURETOR WITH AN AUTOMATIC CHOKE?



You will learn how to replace the diaphragm on a suction carburetor with an automatic choke, so you will need to know where to find this carburetor on the engine. Here is a drawing of this carburetor on an engine.

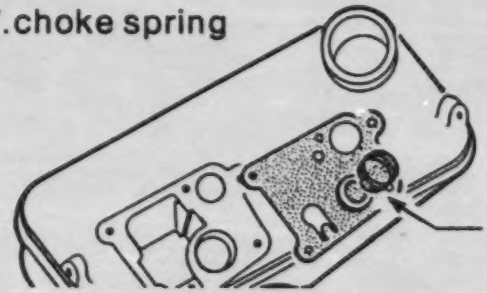


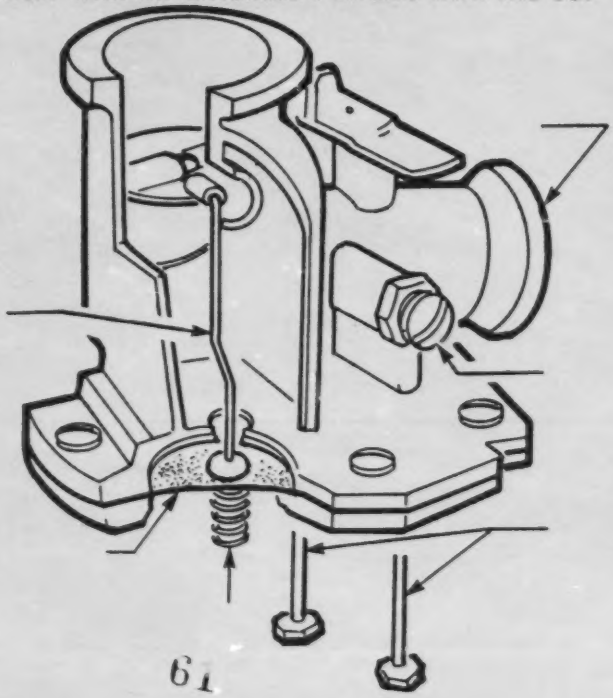
The Parts of a Suction Carburetor With an Automatic Choke

HOW MUCH DO YOU REMEMBER?

Label the parts of the suction carburetor with an automatic choke with the correct number or word.

1. fuel pipes
2. needle valve
3. diaphragm spring and cap
4. "O" ring gasket
5. diaphragm
6. choke link
7. choke spring





61

WHAT DO THE PARTS OF A SUCTION CARBURETOR WITH AN AUTOMATIC CHOKE DO?

1. **Diaphragm**—Works together with the automatic choke parts to help start and increase speed on the engine by letting more or less air into the carburetor. The diaphragm is also a gasket between the carburetor and fuel tank.
2. **Fuel pipes**—Are the 2 fuel pipes on the bottom of the carburetor. The long fuel pipe carries gas from the outer fuel tank to the inner fuel tank. The short fuel pipe shoots gas from the inner fuel tank into the clean air in the carburetor.
3. **Needle valve**—Controls the amount of gas that mixes with clean air in the carburetor. If the needle valve is turned clockwise, then it stops some of the gas that mixes with air.
4. **"O" ring gasket**—Gives a tight fit between the carburetor and intake tube so that the air-fuel mixture does not leak out when it is going to the combustion chamber.

HOW MUCH DO YOU REMEMBER?

Circle the correct answer

1. The diaphragm on a suction carburetor with an automatic choke:
   a. is a gasket between the carburetor and manifold.
   b. works as a fuel pump between the fuel tank and oil pump.
   c. works with the automatic choke and is a gasket between the carburetor and fuel tank.

2. What thing carries gasoline from the fuel tank up into the carburetor?
   a. intake manifold
   b. fuel pipes
   c. "O" ring

3. The job of the needle valve is to:
   a. control the amount of oil used by the engine.
   b. control the amount of air going into the engine.
   c. control the amount of gas that mixes with clean air.

4. What kind of gasket gives a tight fit between the carburetor and intake tubes so the fuel mixture does not leak out while it's going to the combustion chamber?
   a. "O" ring gasket
   b. "B" ring gasket
   c. paper gasket

HOW DOES THE AUTOMATIC CHOKE WORK?

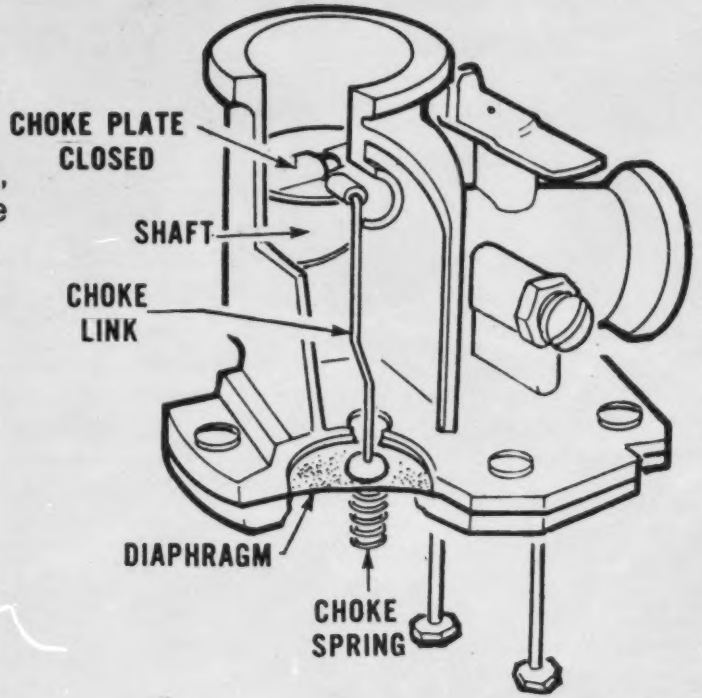
1. The choke controls the amount of air going into the carburetor.

2. The choke is used for helping the engine to start when it is cold. When it is cold, the engine needs more fuel than air, so the choke is closed to stop some of the air from going into the carburetor.

3. Some chokes are manual. On the manual choke, the operator must move the choke open or closed.

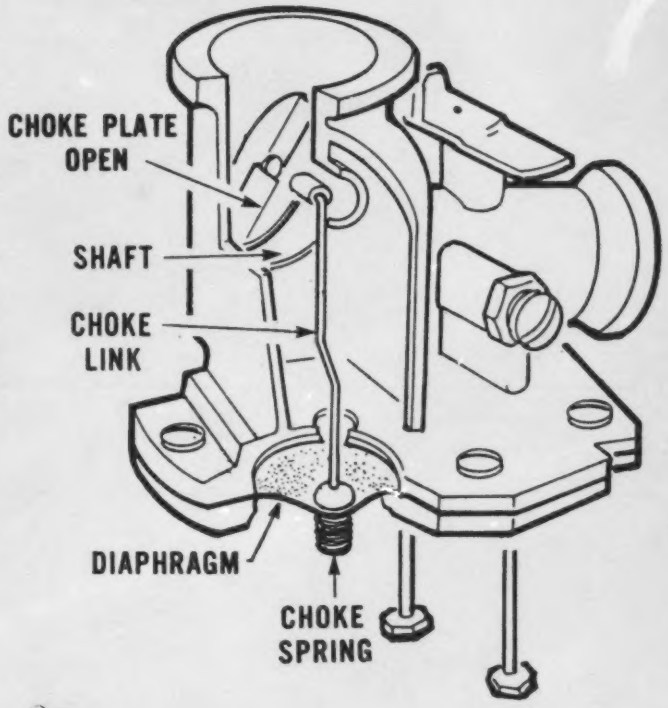
4. On the automatic choke, the operator doesn't have to open or close the choke because the choke parts work together to open and close the choke.

5. When the engine is not running, the diaphragm holds the choke link up so that the choke is closed.



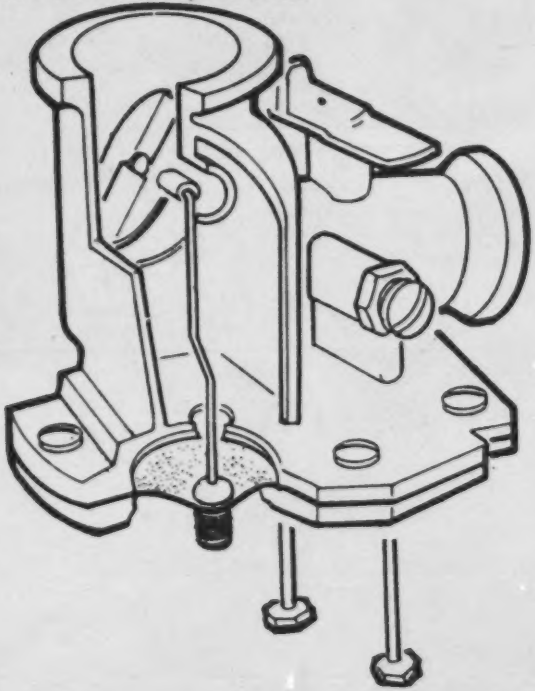
65

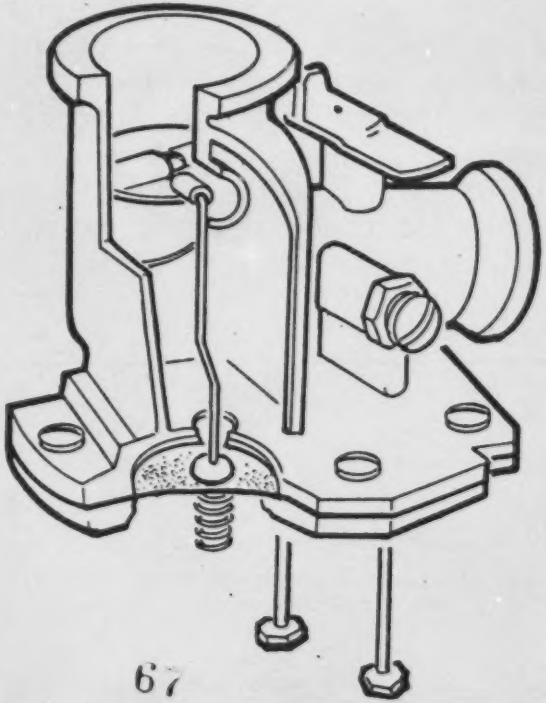
6. When the engine is cranked and the piston moves down, the vacuum that is created pulls the diaphragm and choke link down, and the choke plate opens. The choke stays open all the time the engine is running; then the engine is stopped, the choke spring pushes the diaphragm and choke link up to close the choke plate.



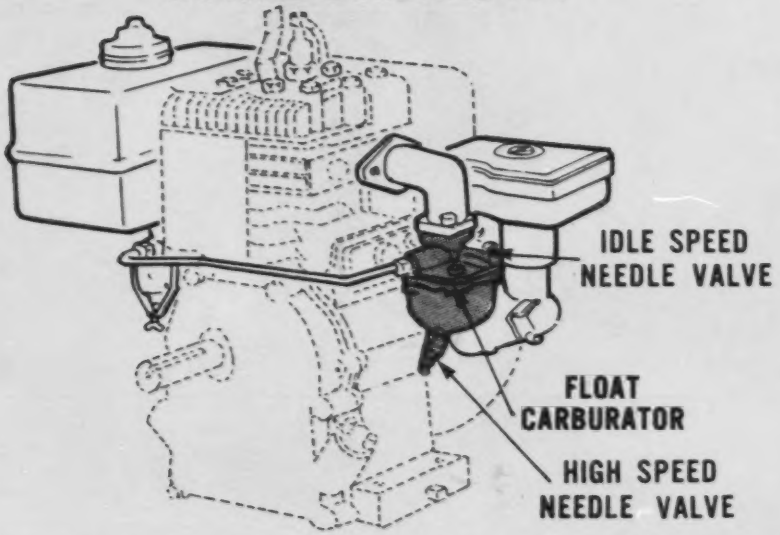
HOW MUCH DO YOU REMEMBER?

One of these pictures shows what happens in the automatic choke when the engine is running. The other picture shows what happens in the automatic choke with the picture is not running. Tell what the automatic choke is doing in each of these pictures.



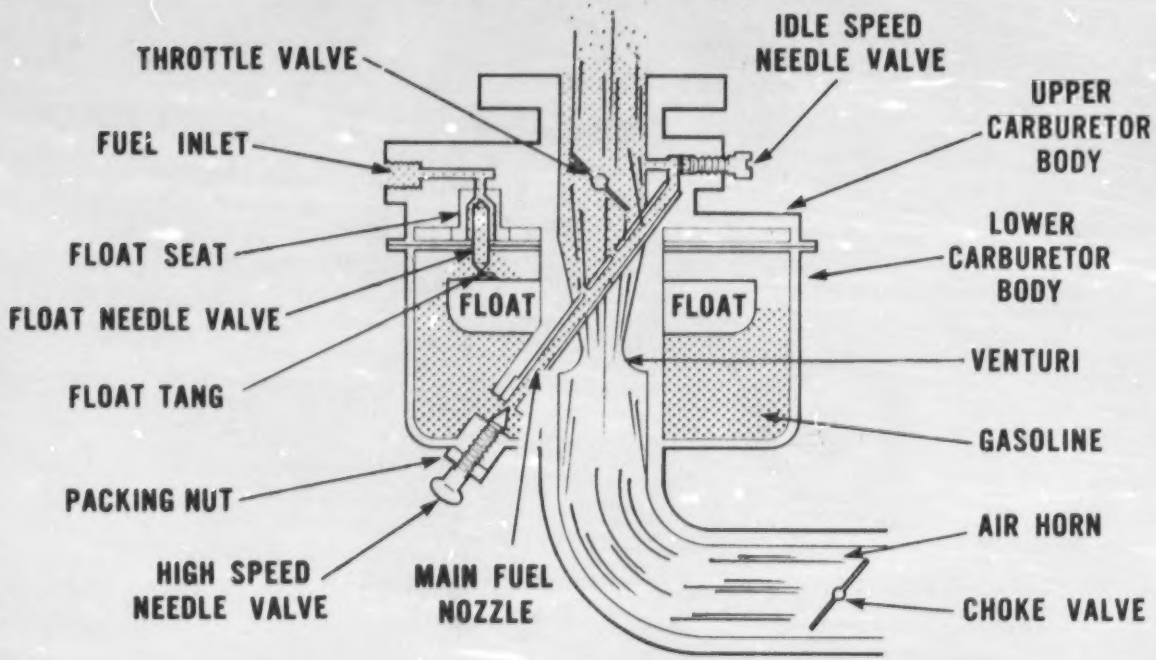


WHAT ARE THE PARTS OF A FLOAT CARBURETOR?



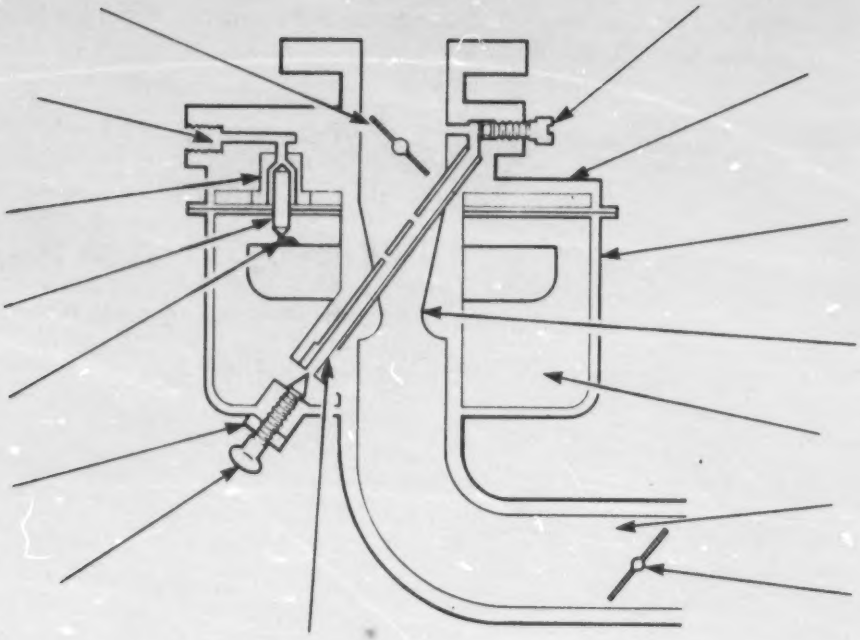
You will learn how to service a 2-piece float carburetor so you will need to know where to find this carburetor on an engine. Here is a drawing of this carburetor on an engine.

THE PARTS OF A 2-PIECE FLOAT CARBURETOR



Label the parts of the 2-piece float carburetor found on the next page with the correct number or word found below.

1. idle-speed needle valve
2. float
3. main fuel nozzle
4. air horn
5. upper carburetor body
6. Venturi
7. float valve seat
8. float needle valve
9. lower carburetor body
10. high-speed needle valve
11. throttle valve
12. choke valve

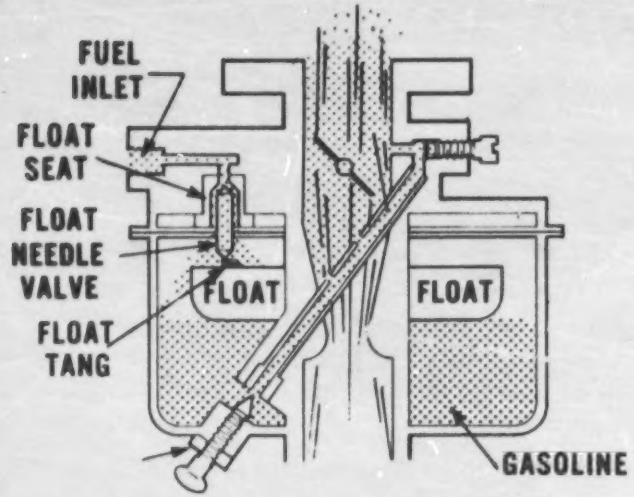


71

WHAT DO THE PARTS OF A FLOAT CARBURETOR DO?

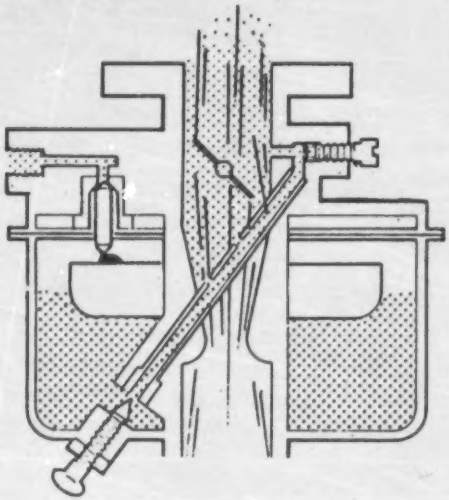
1. **High-speed needle valve**—controls the amount of gas going into the main fuel nozzle. When this needle valve is tightened, it seats in the main fuel nozzle and stops gas from going into it.
2. **Main fuel nozzle**—a brass tube with holes in it that is the seat for the high-speed needle valve and the passageway for gasoline. This nozzle shoots fuel vapor into the Venturi where the air mixes with the fuel vapor.
3. **Idle-speed needle valve**—lets gas go into the air flow when the engine is running at its slowest speed or idling. The engine needs the idle-speed needle valve because when the engine idles, air flows through the Venturi too slow to pick up the fuel vapor from the main fuel nozzle.
4. **Float**—a ball or donut-shaped ring that floats on top of the gas that is stored in the lower carburetor body. The float helps to keep the same amount of gas in the carburetor all the time.

5. **Float needle valve**—a small needle that is hooked onto the float. It works together with the float to keep the same amount of gasoline in the carburetor.



LOW FUEL LEVEL

When the gas level goes down, then the float and needle valve go down, and gasoline comes into the carburetor from the float needle valve seat.



HIGH FUEL LEVEL

When the gas level is high, then the float and needle valve rise together and the float pushes the needle valve into the seat and stops the gas from coming into the carburetor.

6. **Choke valve**—a flat round plate in the air horn that controls the amount of clean air that comes into the carburetor from the air cleaner. When an engine is cold, you want to close the choke so that less air and more fuel goes to the combustion chamber so that the engine will start easier.

7. **Throttle valve**—a flat round plate in the carburetor and found above the Venturi. The throttle valve controls how fast the air-fuel mixture goes to the combustion chamber. When the throttle is open, the air-fuel mixture goes very quickly to the engine causing the engine to speed up. When the throttle is half closed, the air-fuel mixture goes slowly to the engine, causing the engine to slow down.

8. **Venturi**—the part of the carburetor air horn above the main fuel nozzle where the carburetor walls come closer together. This small space in the air horn causes the air to move faster and helps to turn the gas into a vapor and mix with the air.

HOW MUCH DO YOU REMEMBER?

Circle the correct answer.

1. The job of the high-speed needle valve is to:
   a. control the amount of air coming into the carburetor
   b. shoot a gas spray into the Venturi
   c. control the amount of gas going into the main fuel nozzle

2. The seat for the high-speed needle valve and passageway for gasoline is called the:
   a. main fuel nozzle
   b. air horn
   c. throttle valve

3. The main fuel nozzle is a:
   a. brass tube with holes in it
   b. plastic tube with no holes in it
   c. a plastic pointed needle

4. The job of the idle-speed needle valve is to:
   a. control the amount of gas going to the main fuel nozzle
   b. let gas go into the air flow when the engine is idling
   c. let a lot of clean air into the carburetor

5. A ball or donut-shaped ring that floats on top of the gas that is stored in the lower carburetor body is called a:
   a. boat
   b. float seat
   c. float

6. The job of the float needle valve is to:
   a. work together with the float to keep the same amount of gasoline in the carburetor
   b. work together with the idle-speed needle valve to put gas into the air horn
   c. shoot a gas spray into the Venturi
7. When the gas level is high in the carburetor, then the float and needle valve rise together and the float:
   a. sinks to the bottom of the carburetor
   b. pushes the needle valve into the seat and tops gas from coming into the carburetor
   c. lets the needle valve drop and more gas comes into the carburetor
8. The job of the choke valve is to:
   a. control the amount of clean air that comes into the carburetor
   b. bring in dirty outside air and clean it
   c. control the amount of gas going into the carburetor

9. The job of the throttle valve is to:
   a. control the amount of clean air that comes into the carburetor
   b. let gasoline go into the air flow
   c. control how fast the air-fuel mixture goes to the combustion chamber

10. The part of the carburetor air horn above the main fuel nozzle where the walls come closer together is called the:
   a. carburetor
   b. Venturi
   c. air cleaner

WHAT DO YOU KNOW ABOUT THE FUEL SYSTEM?

Have your teacher help you rate what you have learned about the fuel system. Use this rating scale and chart for 2 weeks and watch your progress.

RATING		MEANING
1	=	Cannot identify the fact, part, or step
2	=	Remembers most of the facts, parts, or steps
3	=	Understands and explains the facts, parts, or steps

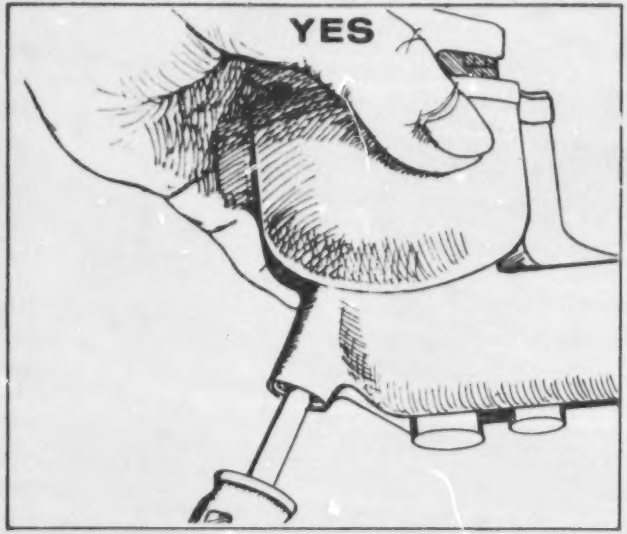
THINGS TO KNOW ABOUT THE FUEL SYSTEM	DAYS									
	1	2	3	4	5	6	7	8	9	10
1. Tell what the fuel system is										
2. Name and find the major fuel system parts										
3. Tell what the fuel system parts do										
4. Name and identify 3 types of fuel-feed systems										
5. Tell what the air cleaner does										
6. Explain the importance of servicing the air cleaner										

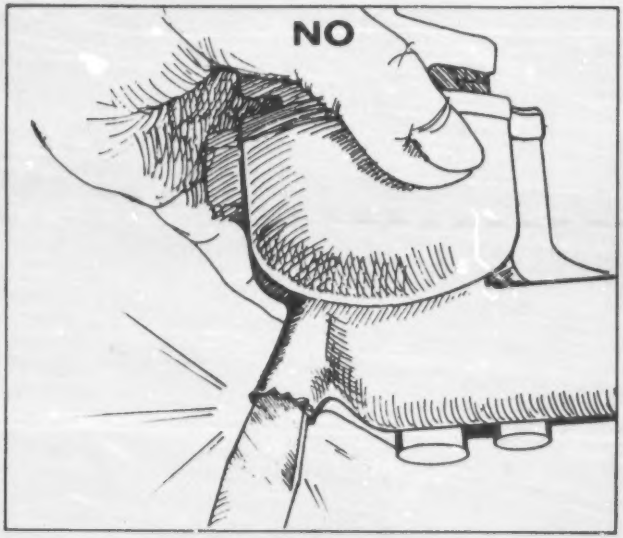
THINGS TO KNOW ABOUT THE FUEL SYSTEM	DAYS									
	1	2	3	4	5	6	7	8	9	10
7. Name and find the parts of the air cleaner										
8. Name and identify the 3 types of air cleaners										
9. Tell 3 things that the carburetor does										
10. Name and tell what the 3 carburetor controls do										
11. Name and identify 3 types of carburetors										
12. Name and find the parts of a suction carburetor with an automatic choke										

THINGS TO KNOW ABOUT THE FUEL SYSTEM	DAYS									
	1	2	3	4	5	6	7	8	9	10
13. Tell what the parts of a suction carburetor with an automatic choke do										
14. Tell how the automatic choke works										
15. Name and find the parts of a 2-piece float carburetor										
16. Tell what the float carburetor parts do										

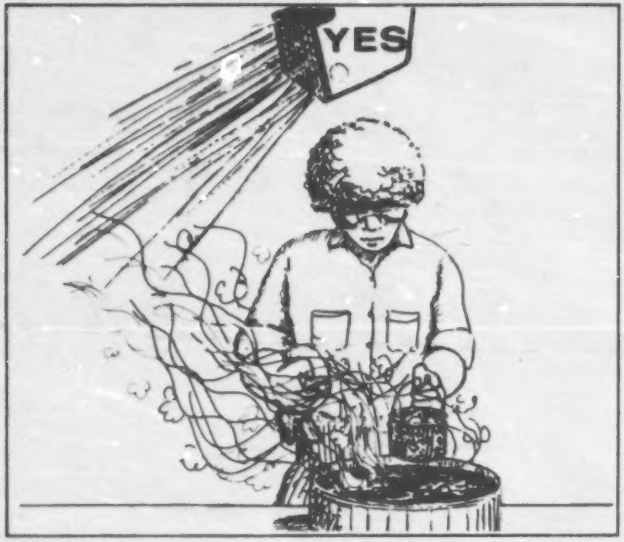
SAFETY TO FOLLOW

Here are some safety rules for working on fuel systems. Learn these and follow them when you work on small gas engines.

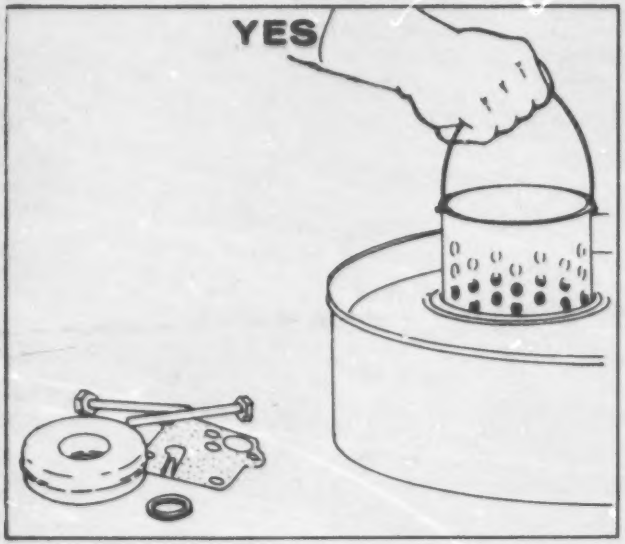


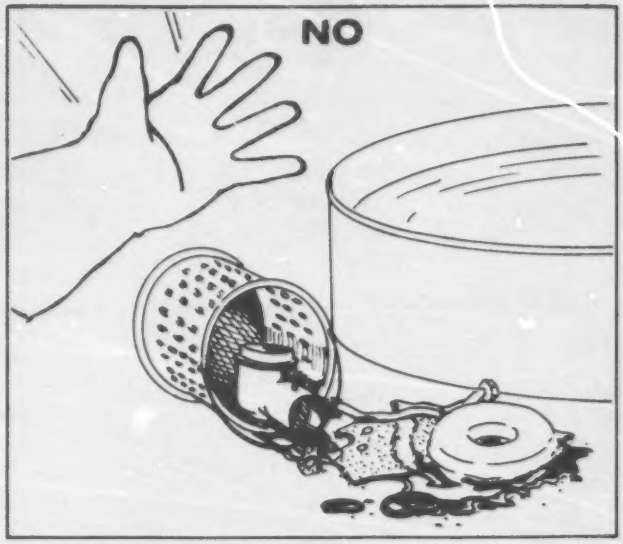


1. Use the correct tool for the job, like the carburetor-jet screwdriver for removing the main fuel nozzle in a float carburetor.

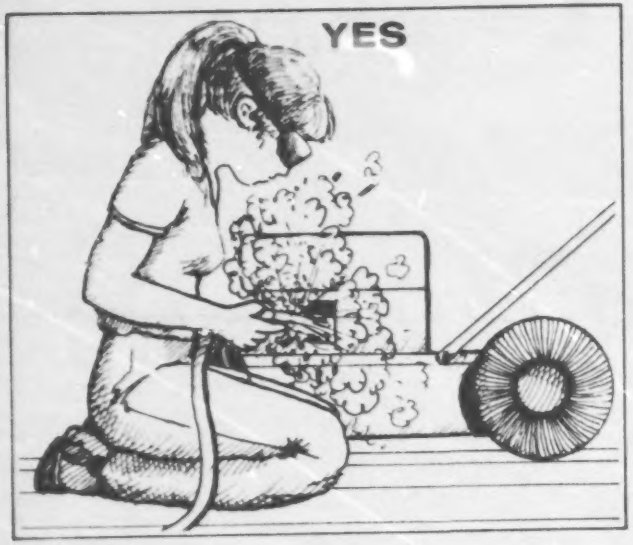


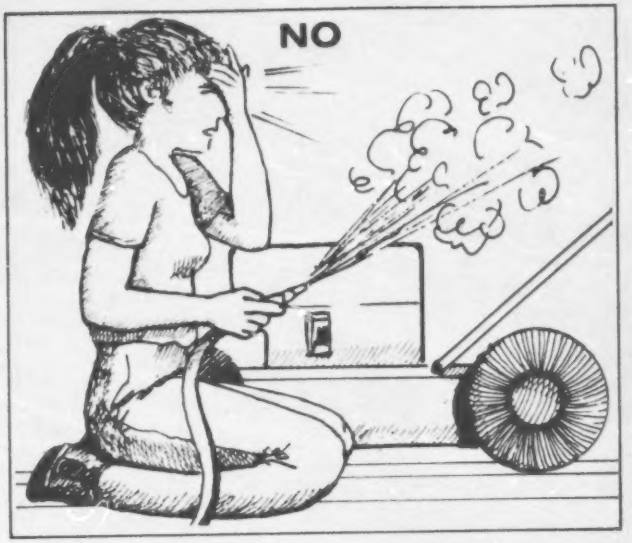
2. When using carburetor cleaner, open a window or turn on the air in the shop and be careful not to get the cleaner on your skin or in your eyes. Carburetor cleaner can hurt you.



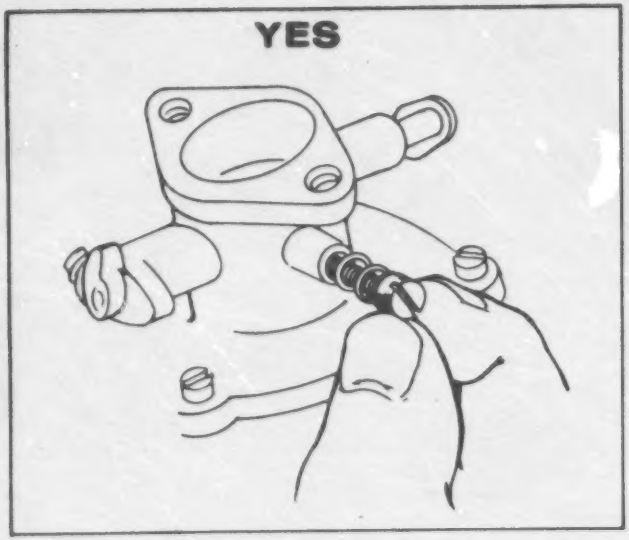


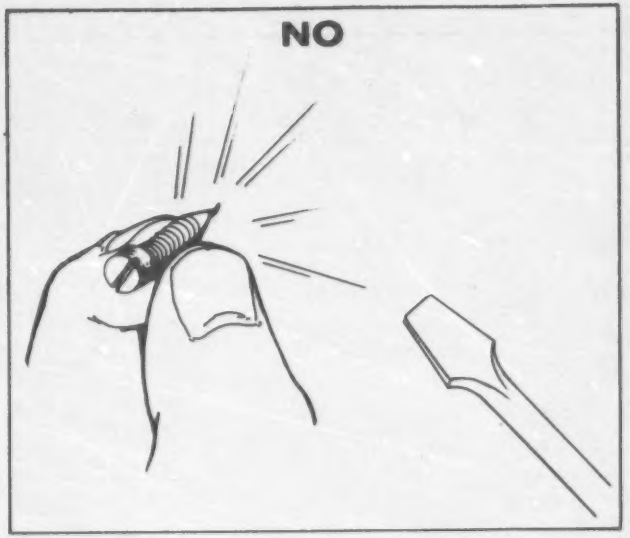
3. Remove all gaskets and nylon or rubber parts on carburetors when soaking them in carburetor cleaner because these parts can melt or become brittle and break.



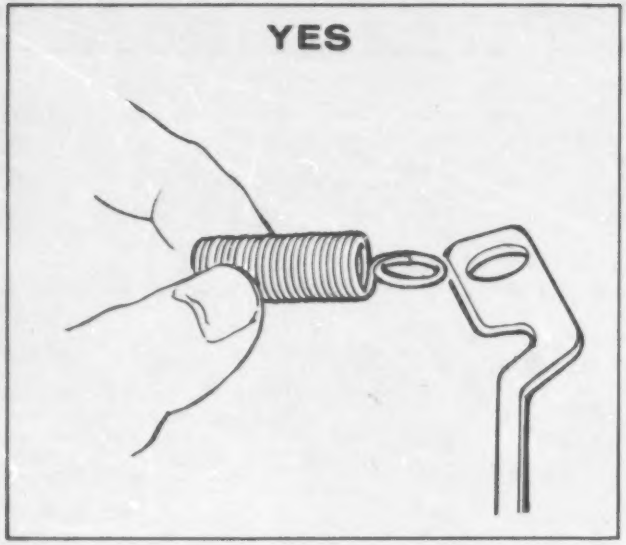


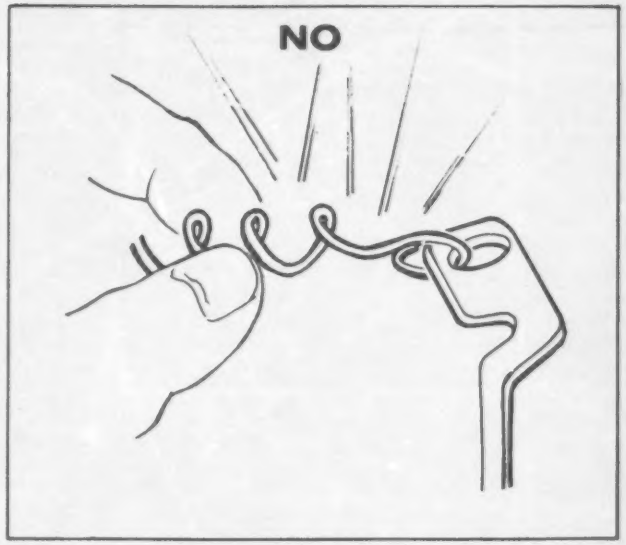
4. Wear safety glasses when using compressed air. Compressed air could blow dirt from the engine parts into your eyes.



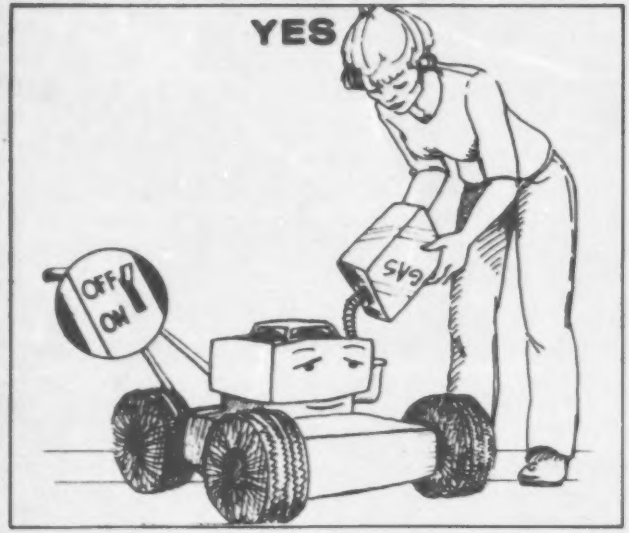


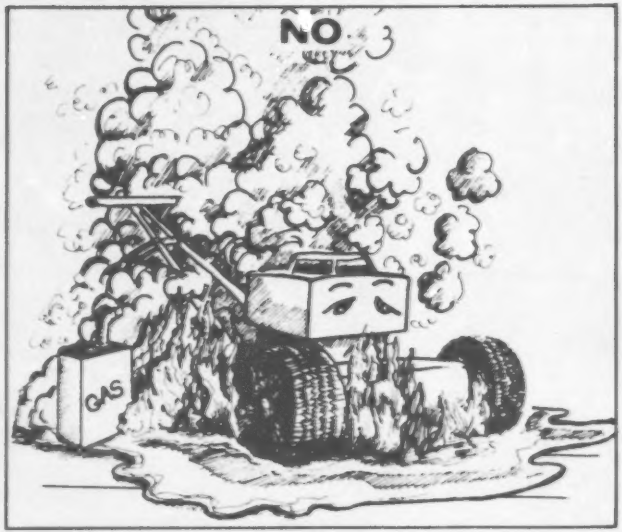
5. Replace carburetor needle valves just until they are seated and not any tighter. The tip ends of the needle valves could be easily damaged if they are overtightened.



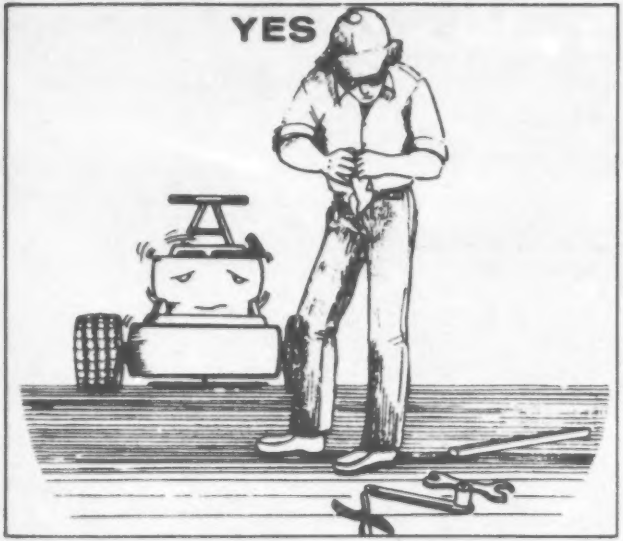


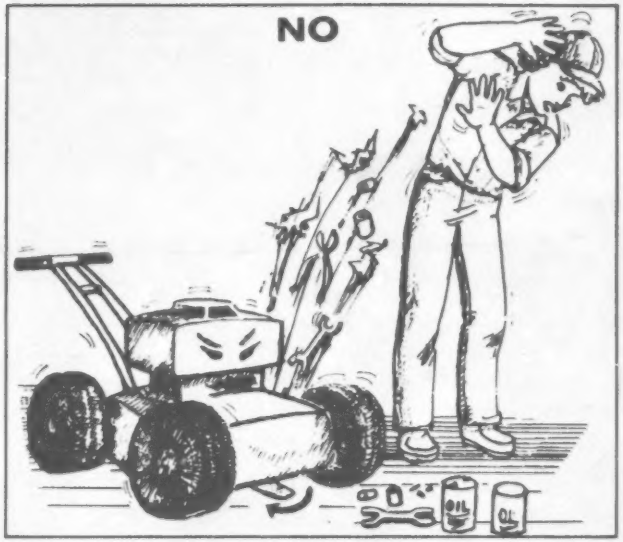
6. When removing a carburetor from an engine, carefully disconnect the governor spring and link so that they are not stretched out of shape. Bending or stretching them will change their length and cause the engine not to run properly.





7. Always turn off the engine before filling the fuel tank. Gasoline can easily start a fire.



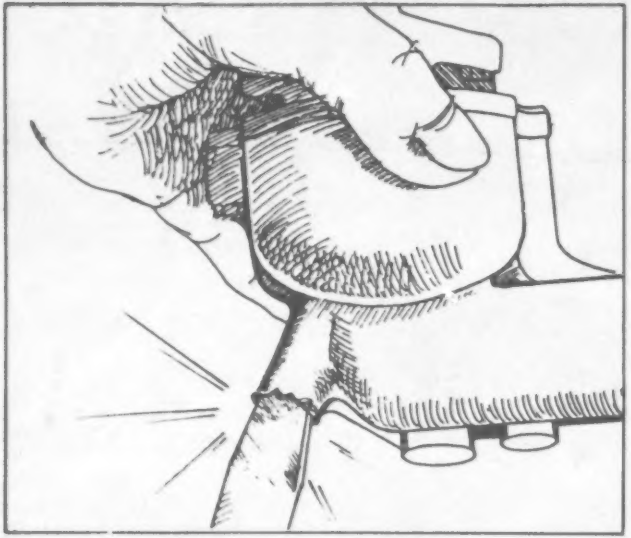


8. When adjusting the carburetor while the engine is running, keep tools and feet away from the moving lawnmower blades.

30

HOW MUCH DO YOU REMEMBER?

In each of the pictures below, tell what safety rule should be followed.



1. _____

_____

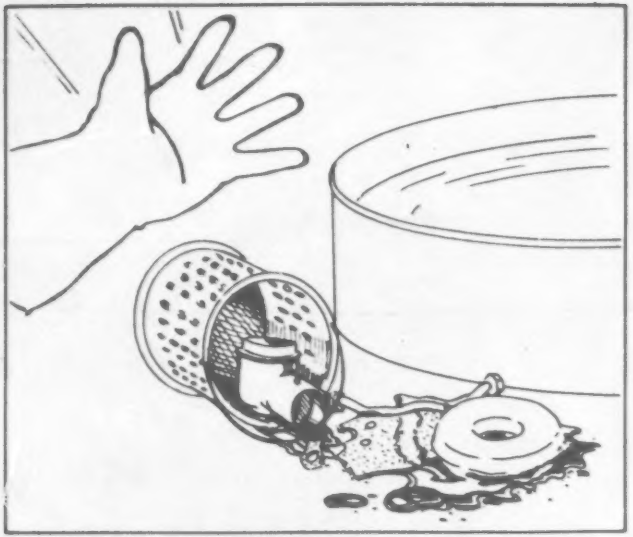
_____

2. _____

_____

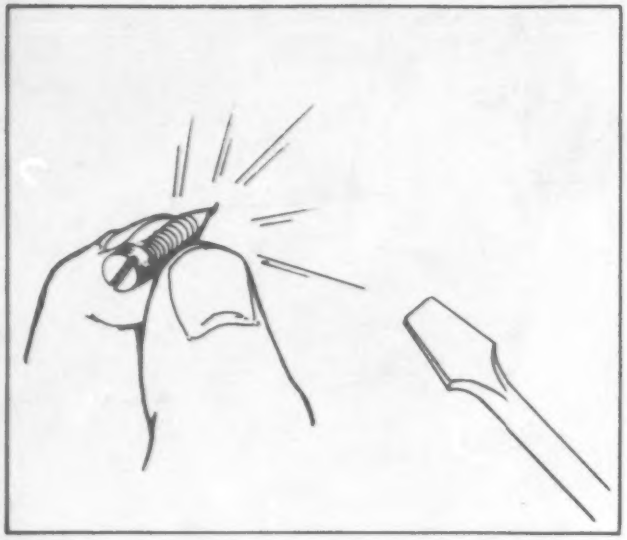
_____

91



3. _____

4. _____

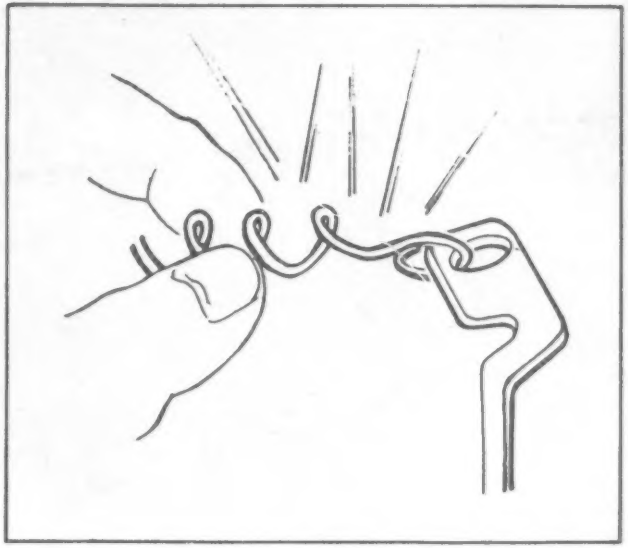


5. _____

_____

_____

_____



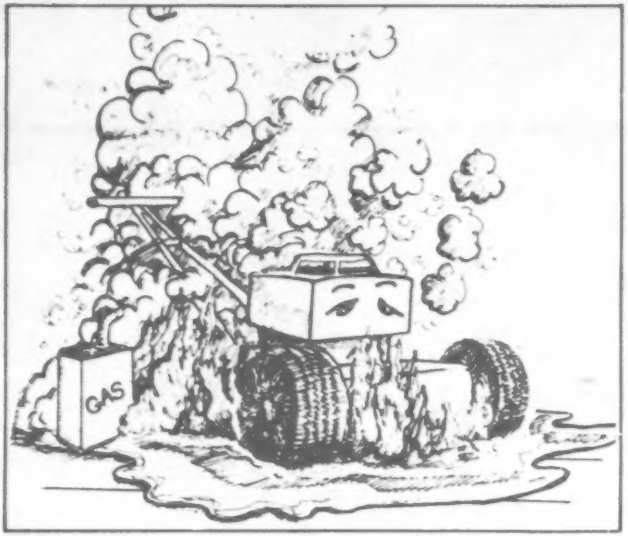
6. _____

_____

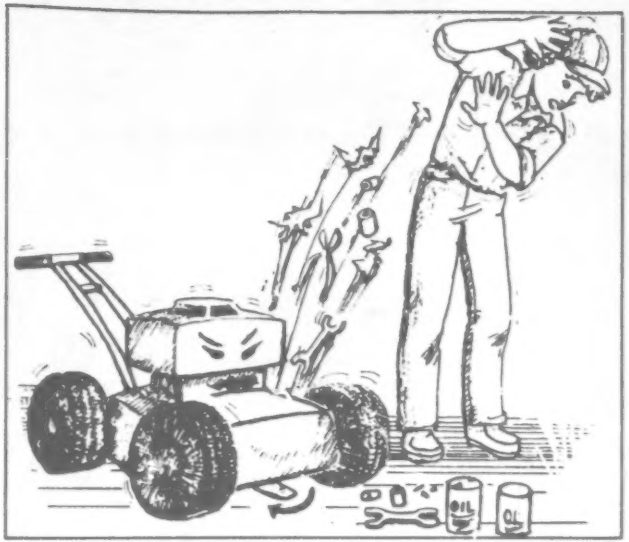
_____

_____

93



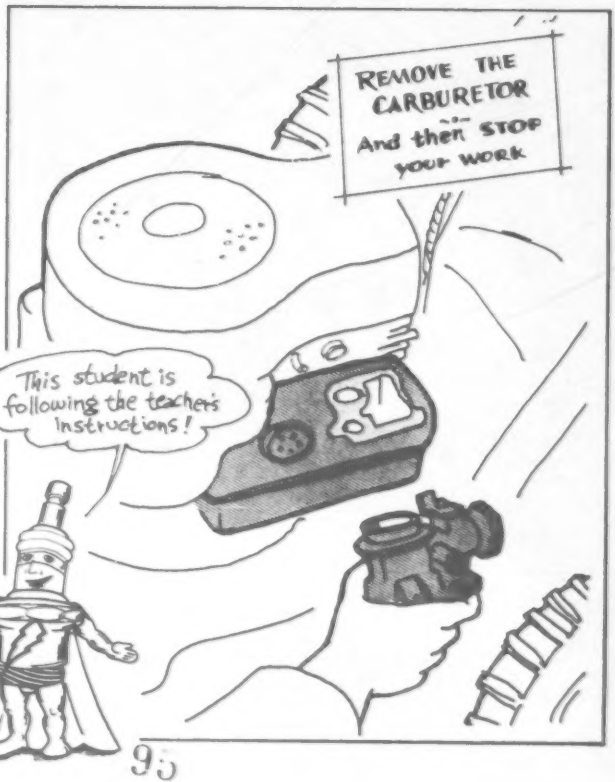
7. _____



8. _____

GOOD WORK HABITS TO FOLLOW

1. Follow your teacher's instructions.
2. Wear well-fitting clothes that are not loose and baggy. Do not wear jewelry. These may catch in moving parts of the engine.
3. Do what you say you will do. In other words, be reliable.
4. Use tools correctly and safely.
5. Discuss any problems that you have instead of arguing or fighting.



95

GOOD WORK HABITS TO FOLLOW

6. Stay on your job instead of horseplaying in the shop.
7. Check your work for errors and try to correct them.
8. When you finish a job, clean the tools and work area, and return tools to the tool room.
9. Walk instead of run in the shop.
10. Be friendly, helpful, and honest.

HOW MUCH DO YOU REMEMBER?

A. Circle the correct answer.

1. Following your teacher's instructions is when you:
   a. do what your teacher tells you to do and then try to finish the job without knowing how to do it.
   b. try to take short cuts and get the job done quicker.
   c. do exactly what your teacher tells you to do and no more.

2. When working on an engine, you should not wear jewelry or baggy clothes because:
   a. they are uncomfortable.
   b. they might get caught in moving parts of the engine.
   c. they don't look good.

3. Being reliable means:
   a. doing what you say you will do.
   b. being smart.
   c. being rough and tough.
4. Using a tool incorrectly and unsafely could
   a. help you finish a job more quickly.
   b. not hurt the engine, tool , or mechanic.
   c. break the engine or tool, or hurt the mechanic.
5. When another student is using a tool that you need and the student does not want to lend it to you, you should:
   a. hit the student in the nose.
   b. quietly tell the student that you only need the tool for a few minutes and that you will give it back.
   c. argue and accuse the student of being selfish.

6. Horseplaying in the shop is when you:
   a. leave your job and go have fun with other students.
   b. stay on your job and ignore other students who are laughing and running around.
   c. clean up your work area and put tools back in the tool room.
7. If you check your work for errors and try to correct them, then you are:
   a. wasting time.
   b. being sloppy and not paying attention to your work.
   c. trying to do a good job by looking for mistakes and then doing the job right.
8. When you finish a job, you should:
   a. go horseplay.
   b. clean the tools and work area, and return tools to the tool room.
   c. clean your work area, but leave the tools out for someone else.

9. While in the shop, you should walk instead of run because:
   a. it makes your teacher nervous when you run.
   b. you could hurt yourself or someone else or break something.
   c. you should always hurry so it's okay to run in the shop.
10. A small engine mechanic should try to:
   a. be friendly, helpful and honest.
   b. tell a lot of jokes.
   c. put a wrench in their pocket and then forget to return it to the tool room.

B. In your class, read each of the 10 good work habits. Tell what might happen if these work habits are not followed. Think of other good work habits that you and your class would like to follow.

CAN YOU FOLLOW SAFETY AND GOOD WORK HABITS?

As you learn the jobs on the fuel system, have your teacher help you rate how well you follow safety and good work habits. Use this rating scale and chart for 2 weeks and watch your progress.

RATING		MEANING
1	=	Does not do the safety or work habit
2	=	Sometimes does the safety or work habit, but needs to be reminded
3	=	Does the safety or work habit most of the time

101

SAFETY AND GOOD WORK HABITS	DAYS									
	1	2	3	4	5	6	7	8	9	10
1. Uses the correct tool for the job										
2. When using carburetor cleaner, vents work area and does not get cleaner on skin or in eyes										
3. Removes all nylon and rubber parts when using carburetor cleaner										
4. Wears safety glasses when using compressed air										
5. Does not overtighten needle valves in carburetor										
6. Does not stretch or bend governor spring and link										

SAFETY AND GOOD WORK HABITS	DAYS									
	1	2	3	4	5	6	7	8	9	10
7. Turns off the engine before filling the fuel tank										
8. When adjusting the carburetor, keeps tools and feet away from moving engine parts										
9. Follows teacher's instructions										
10. Wears well-fitting clothes										
11. Is reliable										
12. Uses tools correctly and safely										

SAFETY AND GOOD WORK HABITS	DAYS									
	1	2	3	4	5	6	7	8	9	10
13. Discusses problems instead of arguing or fighting										
14. Stays on job										
15. Checks work for errors and corrects them										
16. Cleans tools and work area and returns tools to tool room										
17. Walks instead of running										
18. Is friendly, helpful, and honest										

Notes